Fishery Data Series No. 06-28

Tatlawiksuk River Salmon Studies, 2005

Annual Report for Study 04-310
USFWS Office of Subsistence Management
Fisheries Information Services Division and
Bering Sea Fishermen's Association

by

Daniel J. Costello,

Robert Stewart,

Douglas B. Molyneaux,

and

David E. Orabutt

May 2006

Alaska Department of Fish and Game **Divisions of Sport Fish and Commercial Fisheries**

Symbols and Abbreviations

The following symbols and abbreviations, and others approved for the Système International d'Unités (SI), are used without definition in the following reports by the Divisions of Sport Fish and of Commercial Fisheries: Fishery Manuscripts, Fishery Data Series Reports, Fishery Management Reports, and Special Publications. All others, including deviations from definitions listed below, are noted in the text at first mention, as well as in the titles or footnotes of tables, and in figure or figure captions.

Weights and measures (metric)	
centimeter	cm
deciliter	dL
gram	g
hectare	ha
kilogram	kg
kilometer	km
liter	L
meter	m
milliliter	mL
millimeter	mm
Weights and measures (English)	
cubic feet per second	ft^3/s
foot	ft
gallon	gal
inch	in
mile	mi
nautical mile	nmi
ounce	oz
pound	lb
quart	qt
yard	yd
Time and temperature	
day	d
degrees Celsius	°C
degrees Fahrenheit	°F
degrees kelvin	K
hour	h
minute	min
second	s
Physics and chemistry	
all atomic symbols	
alternating current	AC
ampere	A
calorie	cal
direct current	DC
hertz	Hz
horsepower	hp
hydrogen ion activity (negative log of)	pH
parts per million	ppm
parts per thousand	ppt, ‰
volts	V
watts	W

General	
Alaska Administrative Code	AAC
all commonly accepted abbreviations	e.g., Mr., Mrs., AM, PM, etc.
all commonly accepted professional titles	e.g., Dr., Ph.D., R.N., etc.
at	@
compass directions:	
east	E
north	N
south	S
west	W
copyright	©
corporate suffixes:	
Company	Co.
Corporation	Corp.
Incorporated	Inc.
Limited	Ltd.
District of Columbia	D.C.
et alii (and others)	et al.
et cetera (and so forth)	etc.
exempli gratia (for example)	e.g.
Federal Information Code	FIC
id est (that is)	i.e.
latitude or longitude	lat. or long.
monetary symbols (U.S.)	$, ¢
months (tables and figures): first three letters	Jan,...,Dec
registered trademark	®
trademark	™
United States (adjective)	U.S.
United States of America (noun)	USA
U.S.C.	United States Code
U.S. state	use two-letter abbreviations (e.g., AK, WA)

Measures (fisheries)	
fork length	FL
mideye-to-fork	MEF
mideye-to-tail-fork	METF
standard length	SL
total length	TL
Mathematics, statistics	
all standard mathematical signs, symbols and abbreviations	
alternate hypothesis	H_A
base of natural logarithm	*e*
catch per unit effort	CPUE
coefficient of variation	CV
common test statistics	(F, t, χ^2, etc.)
confidence interval	CI
correlation coefficient (multiple)	R
correlation coefficient (simple)	r
covariance	cov
degree (angular)	°
degrees of freedom	df
expected value	*E*
greater than	>
greater than or equal to	≥
harvest per unit effort	HPUE
less than	<
less than or equal to	≤
logarithm (natural)	ln
logarithm (base 10)	log
logarithm (specify base)	log_2, etc.
minute (angular)	'
not significant	NS
null hypothesis	H_O
percent	%
probability	P
probability of a type I error (rejection of the null hypothesis when true)	α
probability of a type II error (acceptance of the null hypothesis when false)	β
second (angular)	"
standard deviation	SD
standard error	SE
variance	
population	Var
sample	var

FISHERY DATA SERIES NO. 06-28

TATLAWIKSUK RIVER SALMON STUDIES, 2005

by
Daniel J. Costello, Robert Stewart, Douglas B. Molyneaux
Alaska Department of Fish and Game, Division of Commercial Fisheries, Anchorage,
and
David E. Orabutt
Kuskokwim Native Association, Aniak

Alaska Department of Fish and Game
Division of Sport Fish, Research and Technical Services
333 Raspberry Road, Anchorage, Alaska, 99518-1599

May 2006

Development and publication of this manuscript was partially financed by the USFWS Office of Subsistence Management (Project 04-310) Fisheries Resource Monitoring Program under Cooperative Agreement 701814J570 and a grant from the U.S. Bureau of Indian Affairs administered by the Bering Sea Fishermen's Association (#E00441023).

The Division of Sport Fish Fishery Data Series was established in 1987 for the publication of technically oriented results for a single project or group of closely related projects. Since 2004, the Division of Commercial Fisheries has also used the Fishery Data Series. Fishery Data Series reports are intended for fishery and other technical professionals. Fishery Data Series reports are available through the Alaska State Library and on the Internet: http://www.sf.adfg.state.ak.us/statewide/divreports/html/intersearch.cfm This publication has undergone editorial and peer review.

Daniel J. Costello
daniel_costello@fishgame.state.ak.us

Robert Stewart
rob_stewart@fishame.state.ak.us

Douglas B. Molyneaux
doug_molyneaux@fishgame.state.ak.us
Alaska Department of Fish and Game, Division of Commercial Fisheries,
333 Raspberry Road, Anchorage, AK 99518, USA
and
David E. Orabutt
Kuskokwim Native Association, P. O. Box 127, Aniak, AK 99557

This document should be cited as:
Costello, D. J., R. Stewart, D. B. Molyneaux, and D. E. Orabutt. 2006. Tatlawiksuk River salmon studies, 2005. Alaska Department of Fish and Game, Fishery Data Series No. 06-28, Anchorage.

TABLE OF CONTENTS

TABLE OF CONTENTS (Continued)

TABLE OF CONTENTS (Continued)

LIST OF TABLES

LIST OF FIGURES

LIST OF FIGURES (Continued)

Figure **Page**

LIST OF FIGURES (Continued)

LIST OF APPENDICES

ABSTRACT

The Tatlawiksuk River is a tributary of the Kuskokwim River, and produces Chinook salmon *Oncorhynchus tshawytscha*, chum salmon *O. keta*, and coho salmon *O. kisutch* that contribute to intensive subsistence and commercial salmon fisheries downstream of its confluence. The Tatlawiksuk River weir is one of several projects operated in the Kuskokwim Area that form an integrated geographic array of escapement monitoring projects. Collectively, and in accordance with the State of Alaska's Policy for the Management of Sustainable Salmon Fisheries (5 AAC 39.222), this array of projects is a tool to ensure appropriate geographic and temporal distribution of spawners, and provide a means to assess trends in escapement that should be monitored and considered in harvest management decisions. Towards this end, Tatlawiksuk River weir has been operated annually since 1998 to determine daily and total salmon escapements for the target operational period of 15 June through 20 September; to estimate age, sex, and length compositions of Chinook, chum, and coho salmon escapement; to monitor environmental variables that influence salmon productivity; and to provide part of an integrated platform in support of other Kuskokwim Area fisheries projects.

In 2005, a resistance board weir was successfully operated on the Tatlawiksuk River from 15 June through 23 September, with one inoperable period from 10 to 19 September. Escapements for the target operational period included 2,918 Chinook, 55,720 chum, 7,495 coho, and 77 sockeye salmon *O. nerka*. Formal escapement goals do not exist for the Tatlawiksuk River; however, Chinook and chum salmon escapements were higher than in previous years, and the coho salmon escapement was below average. Age, sex, and length (ASL) samples were taken from 13.2% of the Chinook escapement, 1.9% of the chum escapement, and 6.4% of the coho escapement. The Chinook sample composition included 49.5% age-1.3 fish, 35.6% age-1.4 fish, 13.4% age-1.2 fish, and 42.6% females. The chum salmon escapement was comprised of 89.4% age-0.3 fish, 5.4% age-0.4 fish, 5.2% age-0.2 fish, and 58.1% females. The coho salmon escapement was comprised of 89.7% age-2.1 fish, 5.9% age-3.1 fish, 4.4% age-1.1 fish, and 48.2% females. In addition to enumerating escapement and estimating ASL composition, the weir served as a platform for several other projects including *Inriver Abundance of Chinook Salmon in the Kuskokwim River* (FIS 02-015), *Kuskokwim River Sockeye Salmon Radiotelemetry Feasibility Study, Kuskokwim River Salmon Mark–Recapture Project* (FIS 04-308), and *Genetic diversity of Chinook salmon from the Kuskokwim River* (FIS 01-070). The objectives relating to these projects were fully achieved in 2005.

Key words: Chinook salmon, *Oncorhynchus tshawytscha*, chum salmon, *O. keta*, coho salmon, *O. kisutch*, longnose suckers, *Catostomus catostomus*, escapement, age-sex-length, Tatlawiksuk River, Kuskokwim River, resistance board weir, radiotelemetry, mark–recapture, genetic stock identification, stock specific run timing

INTRODUCTION

The Kuskokwim River is the second largest river in Alaska, draining an area approximately 130,000 km^2, or 11% of the total area of Alaska (Figure 1; Brown 1983). Each year mature salmon *Oncorhynchus spp.* return to the river to spawn, supporting an annual average subsistence and commercial harvest of over 1 million salmon (Whitmore et al. 2005). The subsistence salmon fishery in the Kuskokwim Area is one of the largest and most important in the state (ADF&G 2003; Coffing 1991, *Unpublished* a, b; Coffing et al. 2001; Ward et al. 2003; Whitmore et al. 2005), and remains a fundamental component of local culture. The commercial salmon fishery, though modest in value compared to other areas of Alaska, has been an important component of the market economy of lower Kuskokwim River communities (Buklis 1999; Whitmore et al. 2005).

Salmon that contribute to these fisheries spawn and rear in nearly every tributary of the Kuskokwim River basin; however, few spawning streams receive rigorous salmon escapement monitoring. Historically, only two long-term, ground-based escapement monitoring projects have operated in the Kuskokwim River basin: the Kogrukluk River weir and Aniak River sonar (Whitmore et al. 2005). These tributaries constitute a modest fraction of the total Kuskokwim

River basin and salmon populations in them are not representative of the diversity of salmon populations that contribute to subsistence, commercial, and sport harvests, or do not take into account the overall ecosystem function in the Kuskokwim drainage. Other ground-based escapement monitoring projects have been developed within the Kuskokwim River basin, but these initiatives were short-lived (Whitmore et al. 2005). Aerial stream surveys are periodically conducted on many tributaries using fixed-wing aircraft, but these surveys serve only as abundance indices because they are flown only once each season, are subject to a high degree of variability, and are geographically skewed towards lower Kuskokwim River tributaries (Whitmore et al. 2005). The inception of the Tatlawiksuk River weir in 1998, coupled with other initiatives begun in the late 1990s and beyond (Kerkvliet et al. 2003; Schwanke et al. 2001; Stroka and Brase 2004; Stuby 2003), provides some of the additional escapement monitoring and abundance estimates required for management authorities to assess the adequacy of escapements and the effectiveness of management decisions (Holmes and Burtkett 1996; Mundy 1998).

The goal of salmon management is to provide for long-term sustainable fisheries by ensuring adequate numbers of salmon escape to the spawning grounds each year. Since 1960, management of Kuskokwim River subsistence, commercial, and sport fisheries has been the responsibility of the Alaska Department of Fish and Game (ADF&G). Management authority for the subsistence fishery was broadened in October 1999 to include the federal government under Title VIII of the Alaska National Interest Lands Conservation Act (ANILCA). The U.S. Fish and Wildlife Service (USFWS) is the federal agency most involved within the Kuskokwim Area. In addition, tribal groups such as the Kuskokwim Native Association (KNA) are charged by their constituency to actively promote a healthy and sustainable subsistence salmon fishery. These and other groups have combined their resources to develop projects such as the Tatlawiksuk River weir to better achieve the common goal of providing for long-term sustainability of salmon fisheries in the Kuskokwim River.

Sustainable salmon fisheries require more than just adequate escapement numbers. Escapement projects, such as Tatlawiksuk River weir, commonly serve as platforms for collecting other types of information useful for management and research. Collection of age, sex, and length (ASL) data are typically included in most escapement monitoring projects, and Tatlawiksuk River weir is no exception (Costello et al. 2006; Estensen 2002; Jasper et al. *In prep*; Roettiger et al. 2005; Stewart et al. *In prep*; Zabkar et al. *In prep*). Knowledge of ASL composition can provide insights into understanding fluctuations in salmon abundance and is essential in developing spawner-recruit relationships used in formulating escapement goals (DuBois and Molyneaux 2000). The Tatlawiksuk River weir also serves as a platform for collecting information on habitat variables. Water temperature, water chemistry, and stream discharge (level) are fundamental variables of the stream environment that directly or indirectly influence salmon productivity and timing of salmon migrations (Hauer and Hill 1996; Kruse 1998; Quinn 2005). Since these variables can be affected by human activities (i.e., mining, timber harvesting, man-made impoundments, etc.; NRC 1996) or climatic changes (e.g., El Nino and La Nina events), data collection for such variables are included in the project operational plan even though water chemistry was last collected in 2002 (Linderman et al. 2003).

BACKGROUND

The Tatlawiksuk River is a tributary of the middle Kuskokwim River basin and provides spawning and rearing habitat for Chinook, chum, and coho salmon (ADF&G 1998). According to local residents, Athabaskan groups harvested salmon from Tatlawiksuk River using fish fences and traps into the mid-1900s (Andrew Gusty Sr., Resident, Stony River village; personal communication). Since 1968, biologists from ADF&G periodically observed salmon escapements in the mainstem Tatlawiksuk River by means of aerial surveys, which coincided with peak Chinook and chum salmon spawning activity (Burkey and Salomone 1999; Schneiderhan *Unpublished*).

Salmon escapement monitoring began at the Tatlawiksuk River in 1998 through the joint effort of Kuskokwim Native Association and ADF&G (Linderman et al. 2002). Operations in 1998 were incomplete and the fixed-panel weir design was replaced with a resistance board weir in 1999, which improved performance in subsequent years. Since then, the Tatlawiksuk River weir has been collecting information on Chinook, chum, and coho salmon escapement, ASL composition, habitat variables, and has served as a platform for other collaborative research efforts.

OBJECTIVES

The annual objectives for the Tatlawiksuk River weir project (FIS 04-310) were to:

1. Determine daily and total annual escapements of Chinook, chum, and coho salmon to Tatlawiksuk River during the target operational period from 15 June through 20 September;
2. Estimate the age, sex, and length composition of total Chinook, chum, and coho salmon escapements to Tatlawiksuk River from a minimum of 3 pulse samples, one collected from each third of the run, such that simultaneous 95% confidence intervals of age composition in each pulse are no wider than 0.20 ($\alpha = 0.05$ and $d = 0.10$);
3. Monitor habitat variables and determine possible effects of water level and water temperature on salmon migration past the weir; and
4. Provide for collaborative, efficient research in the Kuskokwim River system by:
    a. Serving as a monitoring location for Chinook salmon equipped with radio transmitters deployed as part of *Inriver Abundance of Chinook Salmon in the Kuskokwim River* (FIS 02-015);
    b. Serving as a monitoring location for sockeye salmon equipped with radio transmitters deployed as part of *Kuskokwim River Sockeye Salmon Radiotelemetry Feasibility Study*;
    c. Serving as a recovery location for tagged Chinook, chum, sockeye, and coho salmon in support of *Kuskokwim River Salmon Mark–Recapture Project* (FIS 04-308); and
    d. Serving as a collection site for salmon tissue samples for *Genetic Diversity of Chinook Salmon from the Kuskokwim River* (FIS 01-070).

METHODS

STUDY AREA

Tatlawiksuk River originates in the foothills of the Alaska Range and flows southwesterly for 113 km, draining an area of approximately 2,106 km^2 before joining the Kuskokwim River at river kilometer (rkm) 563 (Figure 2; Brown 1983). Throughout most of the river's course, it meanders across wide, flat valleys vegetated with white spruce and scattered birch or aspen.

Black spruce is more characteristic in poorly drained areas of the basin, and dense stands of willow and alder occur on sand and gravel bars. Unnamed streams that join the Tatlawiksuk River from the southeast and northeast drain extensive bog flats and swampy lowlands in the lower reaches of the basin. The channel gradient of the lower 80 km is approximately 1.5 m per km (Brown 1983).

WEIR DESIGN

Installation Site

The Tatlawiksuk River weir is located approximately 16 rkm upstream from Sinka's Landing (Gregory family homestead) and 32 rkm from the village of Stony River. Personnel and supplies are transported to and from the weir via skiff from Stony River or floatplane.

The weir was installed in 2005 in the same location used in previous years, which is about 568 rkm from the mouth of the Kuskokwim River, and 5 km upstream from the confluence with the Kuskokwim River (Figures 1 and 2). Areas further downstream are considered unsuitable due to excessive water depth, poor stream and bank profile, and poor substrate type. At the weir site, the Tatlawiksuk River is about 64 m wide and has a depth of about 1 m during normal summer operations. The weir is positioned in the center of a wide bend, adjacent to a high cut bank to the east and a small floodplain to the west. Dense patches of alder and willow suggest the floodplain is at an intermediate stage of succession, and terracing of the floodplain indicates that the stream channel has shifted course many times. The floodplain is interspersed with small channels that remain isolated except in periods of extreme high water, presumably during the spring runoff.

Construction

The design and materials used to construct the Tatlawiksuk River resistance board weir are described in detail in Tobin (1994) with panel modifications described in Stewart (2002). The weir was installed across the entire 210-ft (64-m) channel following the techniques described by Stewart (2003). The substrate rail and resistance board panels covered the middle 190-ft (58-m) portion of the channel, and fixed weir materials extended the weir 10 ft (3 m) to each bank. The pickets were 1-5/16 in (3.33 cm) in diameter and spaced at intervals of 2-5/8 in (6.67 cm) to leave a gap of 1-5/16 in (3.33 cm) between each picket.

A live trap and skiff gate were installed within the deeper portion of the channel. The live trap was also designed as the primary means of upstream fish passage. The trap could be easily configured to pass fish freely upstream, capture individual fish for tag recovery, or trap numerous fish for collection of ASL or genetic samples. The skiff gate allowed boat operators to pass with little or no involvement by the weir crew as the weight of a boat submerged the passage panels and allowed boats to pass over the weir. Boats with jet-drive engines were the most common and could pass up or downstream over the skiff gate after reducing their speed to 5 miles per hr (8 km per hr) or less.

To accommodate downstream migration of longnose suckers *Catastomas catostomas* and other resident species, downstream passage chutes were incorporated into the weir once resident species were observed congregating just upstream. At locations where downstream migrants were most concentrated, chutes were created by releasing the resistance boards on one or two adjacent weir panels so the distal ends dipped slightly below the stream surface. The chute's shallow profile guides downstream migrants while preventing upstream salmon passage. The chutes were monitored and adjusted to ensure salmon were not passing upstream over them.

Downstream passage was not enumerated; however, few salmon have typically been observed passing downstream over these chutes, and these numbers are not considered significant.

Maintenance

The weir was cleaned several times each day, typically at the end of a counting shift. A technician walked across the weir partially submerging each panel, thereby allowing the current to wash debris such as sticks, leaves, fibrous root mats, and fish carcasses downstream. A rake was used to push larger debris loads off the weir. Each time the weir was cleaned, a visual inspection was made of weir panels, substrate rail, fish trap, and fixed weir sections to ensure no breaches would allow fish to pass upstream unobserved. If conditions prevented an adequate visual inspection, technicians used snorkel gear to complete their inspection.

ESCAPEMENT MONITORING

The target operational period for the weir is 15 June to 20 September, although actual operational periods may vary. Total annual escapement is defined as the number of fish that passed within this period. In years when the operational period falls short of the target operational period, or when there are inoperable periods during the season, estimates of the daily salmon passage are made for missed days in order to provide consistent comparisons of escapements among years. Total annual escapement was determined from the total observed and estimated fish passage.

Passage Counts

Passage counts were conducted periodically during daylight hours. Delays in fish passage occurred only at night or during ASL sampling. Crew members visually identified each fish as it passed upstream and recorded it by species on a multiple tally counter. Counting continued for a minimum of 1 hr, or until passage waned. This schedule was adjusted as needed to accommodate the migratory behavior and abundance of fish, or operational constraints such as reduced visibility in evening hours late in the season. Crew members recorded the total upstream fish count in a designated notebook and zeroed the tally counter after each counting session. At the end of each day, total daily and cumulative seasonal counts were copied to logbook forms. These counts were reported each morning to ADF&G staff in Bethel via single side band radio or satellite telephone.

The live trap was used as the primary means of upstream fish passage so crew members could capture and recover information from fish tagged in the mainstem Kuskokwim River. A Plexiglas®[1] viewing window was placed on the stream surface to improve visual identification of fish entering the trap. This allowed passage counts to be conducted from the downstream entrance of the trap, and enabled crew members to capture tagged fish once they entered the trap. A secondary passage gate could be employed if fish were hesitant to enter the live trap. Using the trap as a counting platform, a connecting picket would be removed between two neighboring panels. By folding the panels to stand on edge, an opening 6 feet wide would be created. A rigid aluminum weir panel would be lashed to the upstream ends of the panels to serve as an easily removable gate. When removed for counting the gate would be placed on the river bottom, in front of the opening, to act as a flash panel for the identification of passing fish. Alternatively, a

---

[1] Product names used in this report are included for scientific completeness but do not constitute a product endorsement.

weir panel could be removed from anywhere along the weir, and a crew member could wade next to the opening to conduct a passage count.

Estimating Missed Passage

To allow comparison among years, upstream salmon passage was estimated for days when the weir was inoperable during the target operational period. Estimates were assumed to be zero if passage is considered negligible based on historical data and run timing indicators. Otherwise, estimates for a single day were calculated as the average observed passage 2 days before and after the inoperable day, minus any observed passage from the inoperable day. Daily estimates for inoperable periods lasting 2 or more days can be derived by one of two methods, depending on the situation.

A "linear method" has commonly been used to interpolate daily estimates from average observed passage 2 days before an inoperable period to average observed passage 2 days after the inoperable period. This method results in a linear increase or decrease in daily estimates over the duration of the inoperable period. Daily estimates from this method are calculated using the formula:

$$\hat{n}_{d_i} = \alpha + \beta \cdot i \tag{1}$$

$$\alpha = \frac{n_{d_1-1} + n_{d_1-2}}{2}$$

$$\beta = \frac{\left(n_{d_I+1} + n_{d_I+2}\right) - \left(n_{d_1-1} + n_{d_1-2}\right)}{2\left(I+1\right)}$$

for (d_1, 2, …, d_i, …d_I)

where

$\hat{n}_{d_i}$ = passage estimate for the i^{th} day of the period (d_1, 2, …, d_i, …d_I) when the weir was inoperative;

n_{d_I+1} = observed passage the first day after the weir was reinstalled;

n_{d_I+2} = observed passage the second day after the weir was reinstalled;

n_{d_1-1} = observed passage of 1 day before the weir was washed out;

n_{d_1-2} = observed passage of the second day before the weir was washed out; and

I = number of inoperative days.

A "proportion method" is used if evidence supporting similar fish passage characteristics exists between estimated and model data sets. A model data set could be from a different year at Tatlawiksuk River, or from the same year at a neighboring project. In either case, daily passage is based on a model data set's daily passage proportions, and is calculated using the formula:

$$n_{d_i} = \left(\frac{\left(n_{2d_i} \times n_{1t_1}\right)}{n_{2t_1}}\right) - n_{o_i} \tag{2}$$

where

n_{d_i} = passage estimate for a given day (i) of the inoperable period;

n_{2d_i} = passage for the i^{th} day in the model data set 2;

n_{1t_1} = known cumulative passage for the operational time period (t_1) from the estimated data set 1;

n_{2t_1} = known cumulative passage for the corresponding time period (t_1) from the model data set 2; and

n_{o_i} = observed passage (if any) from the given day (i) being estimated.

Carcasses

Spawned out and dead salmon (hereafter referred to as carcasses) that washed up on the weir were counted by species and sex, and passed downstream. The daily carcass count was tallied by species and recorded into the camp log.

AGE, SEX, AND LENGTH COMPOSITION

Age, sex, and length compositions of the total annual Chinook, chum, and coho salmon escapements were estimated by sampling a fraction of fish passage and applying the ASL composition of those samples to the total annual escapement as described by DuBois and Molyneaux (2000).

Sample Collection

The crew at the Tatlawiksuk River weir employed standard sampling techniques as described by DuBois and Molyneaux (2000). A pulse sampling design was used, in which intensive sampling was conducted for 1 to 6 days followed by a few days without sampling. The goal of each pulse was to collect samples from 210 Chinook, 200 chum, and 170 coho salmon. These sample sizes were selected so that the simultaneous 95% confidence interval estimates of age and sex composition proportions would be no wider than 0.20 (Bromaghin 1993) per pulse for Chinook salmon assuming 10 age/sex categories, for chum salmon assuming 8 age/sex categories, and for coho salmon assuming 6 age/sex categories. Sample sizes for coho salmon were increased from 70 to 170 fish per pulse in 2005, which allowed the characterization of each third of the run. Sample sizes for all species were increased by about 10% from that recommended by Bromaghin (1993) to account for scales that could not be aged. The minimum acceptable number of pulse samples was 3 per species, one pulse sample from each third of the run, to account for temporal dynamics in the ASL composition.

Salmon were sampled from the fish trap installed in the weir. The trap included an entrance gate, holding pen, and exit gate. On days when sampling was conducted, the entrance gate was opened while the exit gate remained closed, allowing fish to accumulate inside the 8 by 5-ft (2.4 by 1.5-m) holding pen. The holding pen was typically allowed to fill with fish and sampling was done during scheduled counting periods. Every fish of the target species was measured for length to the nearest millimeter from mideye to tail fork (METF) and identified as male or female through visual examination of the external morphology. Three scales were removed from the preferred area of the fish (INPFC 1963), which were placed on gum cards and later used to determine age. Detailed sampling methods were similar to those described by Stewart and Molyneaux (2005).

Additional Chinook samples were collected through active sampling in an attempt to meet the pulse samples size objective. Active sampling consisted of capturing and sampling Chinook salmon while actively passing and enumerating all fish. Further details of the active sampling procedures are described in Linderman et al. (2002). This method was also used for tag recoveries.

After sampling was completed, relevant information such as sex, length, date, and location was copied from hardcopy forms to computer mark-sense forms. Further details of sampling procedures can be found in DuBois and Molyneaux (2000) and Linderman et al. (2003). The completed gum cards and data forms were sent to the Bethel and Anchorage ADF&G offices for processing. The original ASL gum cards, acetates and mark-sense forms were archived at the ADF&G office in Anchorage. The computer files were archived by ADF&G in the Anchorage and Bethel offices. Data were also loaded into the Arctic-Yukon-Kuskokwim (AYK) salmon database management system (Brannian et al. 2005).

Estimating Age, Sex, and Length Composition of Escapement

ADF&G staff in Bethel and Anchorage aged scales, processed the ASL data, and generated data summaries as described by DuBois and Molyneaux (2000). These procedures generated two types of summary tables for each species; one described the age and sex composition and the other described length statistics. These summaries account for changes in the ASL composition throughout the season by first partitioning the season into temporal strata based on pulse sample dates, applying ASL composition of individual pulse samples to the corresponding temporal strata, and finally summing the strata to generate the estimated ASL composition for the season. This procedure ensured the ASL composition of the total annual escapement was weighted by abundance of fish in the escapement rather than the abundance of fish in the samples. Likewise, the estimated mean length composition for the total annual escapement was calculated by weighting the mean lengths in each stratum by the escapement of chum salmon past the weir during that stratum. Confidence intervals were constructed for the estimated mean lengths according to Thompson (1992, page 105).

Ages were reported in the tables using European notation (Groot and Margolis 1991). European notation is composed of 2 numerals separated by a decimal, where the first numeral indicates the number of winters spent by the juvenile fish in fresh water and the second numeral indicates the number of winters spent in the ocean. Total age is equal to the sum of these 2 numerals, plus 1 year to account for the winter when the egg was incubating in the gravel. For example, a Chinook salmon described as an age-1.4 fish under European notation has a total age of 6 years.

WEATHER AND STREAM OBSERVATIONS

Daily weather and stream observations were taken in the morning and usually again in the late afternoon to monitor habitat variables. Air and water temperatures were measured using a thermometer calibrated in degrees Celsius. Stream temperature was determined by submerging the thermometer below the water surface until the temperature reading stabilized and air temperature was obtained by placing the thermometer in a shaded location until the temperature reading stabilized. Temperature readings were recorded in the logbook, along with notations about cloud cover, wind direction and speed, and precipitation. Wind speed was estimated to the nearest 5 miles per hour, and daily precipitation was measured using a rain gauge calibrated in millimeters. In 2005, water temperature readings were also obtained from a data logger placed midstream just upstream from the weir. The data logger was programmed to record water temperature every hour during the weir operational period. Records were retrieved at the end of the season and compared to the observed temperature measured using a thermometer.

Water level observations represented the stream height in centimeters above an arbitrary datum plane. Water levels were measured using a staff gage secured to a stake driven into the river bottom near the bank just downstream from the weir. The arbitrary datum plane was pegged to semi-permanent benchmarks intended to allow for consistency of measurements between years (Appendix A1). In 2005, the staff gage was set using the same benchmarks as in 2004 (Stewart and Molyneaux 2005). However, a more permanent benchmark was installed in 2005 that consists of a can lid nailed to the flat surface of a sawed-off stump. The new benchmark is located near the weir panel rack and represents a stream height of 300 cm (Appendix A2).

River discharge measurements were taken four times throughout the season, at times when the river level was near its lowest, highest, and seasonal average. Measurements were taken using a flow meter, an adjustable wading rod, a calibrated steel shaft, and an electronic counter. The flow meter was attached to the wading rod and the beeper to the flow meter. Either one or five revolutions of the flow meter resulted in a beep of the counter. The flow meter was calibrated so that the number of revolutions per minute could be converted to stream velocity. Measurements were taken in 10-ft (3-m) intervals, each representing a unit, across the stream cross section, which was located about 200 m downstream from the weir. At times when the water level was low, the readings were taken by a technician wading across the river. When the water level was high, a cable was stretched across the river and readings were taken from a boat tethered to the cable. Velocity was measured at 60% (from the surface) of the depth of each unit and then multiplied by the area to give the unit discharge. Total discharge was calculated as the sum of the discharges of the 10-ft (3-m) units.

RELATED FISHERIES PROJECTS

Inriver Abundance of Chinook Salmon in the Kuskokwim River

The Tatlawiksuk River weir was part of a radiotelemetry project entitled *Inriver Abundance of Chinook Salmon in the Kuskokwim River* intended to estimate the total abundance of Chinook salmon in the Kuskokwim River (Stuby 2003, 2004, 2005, *In prep*). Radio transmitters were inserted into Chinook salmon caught near upper Kalskag (rkm 270). The Tatlawiksuk River had one of several radio receiver stations intended to monitor passage of radio tagged fish into tributary streams. The Tatlawiksuk River receiver station was placed on the bank, in-line with the weir. Though Chinook salmon were also fitted with a spaghetti tag that allowed the weir crew to recognize a radio tagged fish, no attempt was made to capture these fish since they were monitored by the receiver station and later noted by aerial surveys. The known Chinook salmon passage at the weir, coupled with data collected from the receiver station, were used with similar data collected at other weir projects to develop estimates of the total Chinook salmon abundance upstream from the Lower Kalskag tagging site. Stuby (*In prep*) provides details.

Kuskokwim River Sockeye Salmon Radiotelemetry Feasibility Study

A pilot sockeye salmon radiotelemetry project entitled *Kuskokwim River Sockeye Salmon Radiotelemetry Feasibility Study* was conducted in 2005 to assess the feasibility of conducting a large-scale study in future years. The sockeye salmon radiotelemetry study operated on the infrastructure already in place from the Kuskokwim River tagging study and the Chinook salmon radiotelemetry project, utilizing the same fish wheels and receiver stations. Three additional stations were strategically placed to assess the relative contribution of the Stony River drainage. Tag frequencies were selected to ensure compatibility with the existing receiver stations, one of which was located at the Tatlawiksuk River weir site. In June and July 2005 at a tagging site near Kalskag, a total of 100 sockeye salmon were equipped with radio tags as a primary mark and white spaghetti tags as a secondary mark. The goal of the project in 2005 was to assess the effectiveness of the tags and the tracking methods. Gilk (*Unpublished*) provides details.

Kuskokwim River Salmon Mark–Recapture Project

The Tatlawiksuk River weir was part of a tagging project entitled *Kuskokwim River Salmon Mark–Recapture Project* intended to estimate stock specific run timing, travel speed, and total abundance of Chinook, chum, coho, and sockeye salmon in the Kuskokwim River (Pawluk et al. *In prep* b). Chinook, chum, coho, and sockeye salmon were equipped with Floy® anchor tags at fish wheels located near upper Kalskag. The Tatlawiksuk River weir, located approximately 298 rkm from the tagging sites, served as one of several tag recovery locations for collecting information on tagged fish.

The weir crew captured tagged fish in the fish trap and recorded the date of capture, species, and tag number (when recovered). Tagged fish were captured using the active sampling technique described earlier. Visibility was enhanced through the use of clear-bottom viewing boxes that reduced glare and water turbulence. Once the information was collected from the tag, the fish was released upstream of the weir. If a tagged fish passed the weir without being recaptured, the crew recorded the color of the tag and it was added to the daily tallies. Fish were examined for a secondary mark, in this case a severed adipose fin, through the ASL sampling process and in separate trapping events in order to assess the incidence of tag loss. Pawluk et al. (*In prep* b) provides details.

Genetic Diversity of Chinook Salmon from the Kuskokwim River

Crew members obtained tissue samples from 100 Chinook salmon at Tatlawiksuk River weir as part of a Kuskokwim River Chinook genetics project entitled *Genetic Diversity of Chinook Salmon from the Kuskokwim River* (Templin et al. *In prep*). Genetic samples were gathered during each of 3 ASL sampling pulses to better approximate the genetic composition of Tatlawiksuk River Chinook salmon. After ASL sampling, a piece of an axillary process was cut from the fish, wiped clean, and placed in a vial of isopropyl alcohol. Sampling instruments were cleaned after each fish to prevent cross contamination. Vials were numbered, and the corresponding sex, location, and sampling date were recorded. The tissue samples were sent to the ADF&G Division of Commercial Fisheries Gene Conservation Laboratory. Templin et al. (*In prep*) provides details.

RESULTS

ESCAPEMENT MONITORING

Installation of the Tatlawiksuk River weir began on 9 June and was complete at 2100 hours on 11 June, 3 days before the target operational date of 15 June. Disassembly began on 23 September, but the weir panels were not fully removed until early October due to high water conditions. The weir suffered one inoperable period from 10 through 19 September, and holes were discovered twice during the season: one on 5 July, and another on 7 August. Otherwise, the weir was operational throughout the entire season. Salmon passage was estimated for days when holes were discovered using the method described above for estimating missed passage for single days. Salmon passage was estimated using the "linear method" for the period when the weir was inoperable from 10 to 19 September.

Chinook Salmon

Total annual Chinook salmon escapement upstream of the Tatlawiksuk River weir between 15 June and 20 September 2005 was 2,918 fish (Table 1; Appendix B1). The Chinook escapement consisted of an observed passage of 2,859 fish, and a total of 59 fish were estimated to have passed undetected when the hole was discovered on 5 July. No Chinook salmon were estimated to have passed undetected through the hole discovered on 7 August and Chinook salmon passage was assumed to be zero for the inoperable period from 10 through 19 September, based on available run timing and passage data. The first Chinook salmon was observed on 12 June, the first full day of operation, and the last Chinook salmon was observed on 27 August. Daily passage peaked at 481 fish on 3 July. Based on total annual escapement during the target operational period, the median passage date was 7 July and the central 50% of the run occurred between 3 and 13 July (Table 1; Figure 3).

Chum Salmon

Total annual chum salmon escapement upstream of the Tatlawiksuk River weir between 15 June and 20 September 2005 was 55,720 fish (Table 1; Appendix B2). The chum escapement consisted of an observed passage of 55,315 fish and an estimated passage of 405 fish. A total of 354 and 44 chum salmon were estimated to have passed undetected when holes were discovered on 5 July and 7 August, based on average passage for 2 days before and after the holes were discovered. The first chum salmon was observed on 16 June, and the last chum salmon was observed on 8 September, but an estimated 10 chum salmon passed upstream when the weir was inoperable from 10-19 September using the "linear method" of estimating missed passage. The peak daily passage was 3,283 fish on 16 July. The median passage date was 15 July and the central 50% of the run occurred between 10 July and 21 July, based on total annual escapement during the target operational period (Table 1; Figure 3).

Coho Salmon

Total annual coho salmon escapement upstream of the Tatlawiksuk River weir between 15 June and 20 September 2005 was 7,495 fish (Table 1; Appendix B3). The coho escapement consisted of an observed passage of 6,682 fish and an estimated passage of 813 fish. A total of 41 coho salmon were estimated to have passed undetected when the hole was discovered on 7 August, and 773 were estimated to have passed when the weir was inoperable between 10 and 19 September, using the "linear method" for estimating missed passage. The first coho salmon was observed on 18 July, and the last coho salmon was observed on 22 September, 2 days after the end of the target operational period. The peak daily passage was 881 fish on 24 August, which was also the median passage date. The central 50% of the run occurred between 18 August and 3 September, based on total annual escapement during the target operational period (Table 1; Figure 3).

Other Species

An estimated 77 sockeye salmon passed the weir between 15 June and 20 September (Table 1; Appendix B4), including an observed passage of 74 fish and a total of 3 fish were estimated to have passed undetected when a hole was discovered on 7 August, based on the average passage for 2 days before and after the hole was discovered. No sockeye salmon were estimated to have passed through the hole discovered on 5 July, using the method described above for estimating passage for a single day, and no sockeye salmon were thought to have passed during the inoperable period in September based on available run timing and passage data. The first sockeye salmon was observed on 13 July, and the last sockeye salmon was observed on 1 September. The peak daily passage was 8 fish on 6 August. The median passage date was 30 July and the central 50% of the run occurred between 23 July and 7 August, based on total passage during the target operational period (Table 1).

Pink salmon *O. gorbuscha* are uncommon in the Tatlawiksuk River, and only one was observed passing upstream in 2005.

Four resident fish species were observed passing upstream of the weir in 2005. Longnose suckers were the most abundant, with 1,359 passing the weir during the target operational period. Other species observed passing upstream of the weir in 2005 included 7 whitefish *Coregonus sp*., 15 Arctic grayling *Thymallus arcticus*, and 8 northern pike *Esox lucius* (Appendix C1). No estimates were made for resident fish passage when the weir was inoperable.

Carcasses

A total of 7 Chinook, 1,356 chum, 6 sockeye, and 17 coho salmon carcasses were recovered at the Tatlawiksuk River weir in 2005 (Appendix D1). Chinook carcasses were recovered between 12 July and 3 August. Chum carcasses were recovered between 3 July and 9 September, with 50% cumulative recovery on 25 July. Females accounted for 32% of the recovered chum salmon carcasses. Coho carcasses were first recovered 25 July. Other species recovered included 289 whitefish, 27 northern pike, 12 Arctic grayling, 1 sheefish *Stendous leucichthys nelma*, and 273 longnose suckers.

AGE, SEX, AND LENGTH COMPOSITION

Chinook Salmon

Sampling goals for Chinook salmon were achieved in 2005. The samples were collected in 4 pulses of 269, 58, 122, and 14 fish, for a total of 463. Age, sex, and length were determined for 384 Chinook salmon (83% of the total sample), or 13.2% of the total Chinook escapement in 2005 (Tables 2 and 3). The Chinook run was partitioned into 4 temporal strata based on sampling dates, with sample sizes of 111, 115, 74, and 84 fish, respectively. As applied to the total annual Chinook escapement, the most abundant age class was age 1.3 (49.5%), followed by age 1.4 (35.6%), and age 1.2 (13.4%). Female Chinook salmon comprised 42.6% of the total annual escapement.

Male Chinook salmon ranged in length from 460 to 689 mm at age 1.2, 584 to 840 mm at age 1.3, and 641 to 1250 mm at age 1.4, with mean lengths of 572, 697, and 812 mm, respectively. Female Chinook salmon ranged in length from 600 to 870 mm at age 1.3, 640 to 951 mm at age 1.4, and 725 to 1055 mm at age 1.5, with mean lengths of 719, 786, and 815 mm, respectively (Table 3). Two age-1.5 male Chinook salmon were sampled, with lengths of 713 and 940 mm. Male Chinook salmon lengths ranged from 460 to 1250 mm, while female lengths ranged from 600 to 1055 mm.

Chum Salmon

Sampling goals for chum salmon were achieved in 2005. The samples were collected in 7 pulses of 207, 212, 210, 210, 213, 123, and 57 fish. Age, sex, and length were determined for 1,075 chum salmon (87% of the total sample), or 1.9% of the total chum escapement in 2005 (Tables 4 and 5). The chum run was partitioned into 7 temporal strata based on sampling dates, with sample sizes of 198, 175, 165, 185, 188, 111, and 53 fish, respectively. As applied to the total chum salmon escapement, the most abundant age class was age 0.3 (89.4%), followed by age 0.4 (5.4%), and age 0.2 (5.2%). Female chum salmon comprised 58.1% of the total annual escapement.

Male chum salmon ranged in length from 489 to 535 mm at age 0.2, 407 to 675 mm at age 0.3, and 533 to 680 mm at age 0.4, with mean lengths of 527, 571, and 508 mm, respectively. Female chum salmon ranged in length from 446 to 570 mm at age 0.2, 394 to 635 mm at age 0.3, and 540 to 632 mm at age 0.4, with mean lengths of 521, 546, and 579 mm, respectively (Table 5).

Coho Salmon

Sampling goals for coho salmon were achieved in 2005. The samples were collected in 4 pulses of 44, 186, 171, and 175 fish. Age, sex, and length were determined for 476 coho salmon (83% of the total sample), or 6.4% of the total annual escapement in 2005 (Tables 6 and 7). The coho run was partitioned into 3 temporal strata based on sampling dates, with sample sizes of 193, 138, and 145 fish, respectively. As applied to the total coho salmon escapement, the most abundant age class was age 2.1 (89.7%), followed by age 3.1 (5.9%), and age 1.1 (4.4%). Female coho salmon comprised 48.2% of the total annual escapement.

Male coho salmon ranged in length from 474 to 585 mm at age 1.1, 385 to 642 mm at age 2.1 and 508 to 596 mm at age 3.1, with mean lengths of 534, 555, and 553 mm, respectively. Female coho salmon ranged in length from 482 to 580 mm at age 1.1, 435 to 680 mm at age 2.1, and 415 to 621 mm at age 3.1, with mean lengths of 546, 560, and 560 mm, respectively (Table 7).

WEATHER AND STREAM OBSERVATIONS

A total of 203 complete observations of weather and stream conditions were recorded between 11 June and 26 September 2005. Based on twice-daily thermometer observations, water temperature in the Tatlawiksuk River ranged from 6.0 to 18.0°C, with an average daily temperature of 12.7°C (Appendix E1). Based on hourly data logger readings, daily average water temperature ranged from 6.3 to 17.4°C (Appendix E2), with an average daily temperature of 12.9°C (Appendices E2–E3). River stages ranged from 10.0 to 148.0 cm, with an average of 39.7 cm for the overall operational period (Appendix E1). Based on twice-daily observations, air temperature at the weir ranged from -4.5 to 30.0°C, with an average air temperature of 14.3°C for the operational period (Appendix E1).

Stream discharge was measured four times during the 2005 weir operational period (Figure 4; Appendices E3–E6). On 8 July, when the first measurement of the series was taken, the river stage was near the seasonal average at 30 cm and the stream discharge was 21.1 m^3/s (Figure 4;

Appendix E3). When the second measurement was taken, on 10 August, the river stage was near its seasonal low at 15 cm and the stream discharge was 14.2 m^3/s (Figure 4; Appendix E4). The third measurement, taken on 7 September, had a stream discharge of 46.8 m^3/s at a river stage of 82 cm (Figure 4; Appendix E5). When the last measurement was taken, on 18 September, the river stage was near its seasonal high at 100 cm and the stream discharge was 69.7 m^3/s (Figure 4; Appendix E6).

RELATED FISHERIES PROJECTS

Inriver Abundance of Chinook Salmon in the Kuskokwim River

A total of 12 radio tagged Chinook salmon were detected passing the Tatlawiksuk River weir in 2005. Most radio tagged Chinook salmon were later detected upstream of the Tatlawiksuk River weir during aerial over flights in July and August. Detailed results for the Chinook salmon radiotelemetry study are reported in Stuby (*In prep*).

Kuskokwim River Sockeye Salmon Radiotelemetry Feasibility Study

No radio tagged or spaghetti tagged sockeye salmon were detected or observed passing the receiver station and weir at the Tatlawiksuk River in 2005. Detailed results for the sockeye salmon radiotelemetry pilot project are reported by Gilk (*Unpublished*).

Kuskokwim River Salmon Mark–Recapture Project

Tag recovery efforts at the Tatlawiksuk River weir were successful in 2005. The weir remained operational for nearly the entire Chinook, chum, and sockeye salmon runs, so few tagged fish of these species were likely to have passed the weir without detection. The effect of the 10-day inoperable period in September on coho salmon tag recovery (i.e. recording of the unique tag number) was probably minimal if passage estimates for this period are accurate; only about 10% of the annual passage was estimated to have passed during this period. In addition, all passage was successfully conducted through the live trap despite very low water conditions, enabling crew to recover nearly every tag observed. Occasionally tagged salmon escaped upstream before they could be captured in the live trap, resulting in missed tag recoveries. Tag recovery efforts at the Tatlawiksuk River weir included recovery of all 4 Chinook salmon observed with Floy® tags, all 3 sockeye salmon observed with tags, 161 of 170 chum salmon observed with tags, and 31 of 32 coho salmon observed with tags, resulting in a 92% overall recovery rate. No secondary tag marks were found among 472 Chinook, 2,583 chum, 13 sockeye, and 1,409 coho salmon examined without tags. The recovery of tag numbers offered an opportunity to study migration characteristics of Tatlawiksuk River chum and coho salmon in 2005. Results for the sockeye, chum, and coho salmon tagging study in 2005 will be reported in Pawluk et al. (*In prep* b).

Genetic Diversity of Chinook Salmon from the Kuskokwim River

Tissue samples were collected from 100 Chinook salmon throughout the run for genetic analysis of population structure and genetic stock identification in Anchorage. Results of this study will be reported in Templin et al. (*In prep*).

DISCUSSION

ESCAPEMENT MONITORING

The reported Chinook, chum, sockeye, and coho escapements in 2005 are considered accurate representations of annual escapements to the Tatlawiksuk River. The weir was successfully operated during the target operational period of 15 June and 20 September, although high water levels rendered the weir inoperable for a 10-day period during the later component of the coho salmon run in September. Chinook and chum salmon escapements were determined without reliance on passage estimates, except for days when holes were discovered (5 July and 7 August). Daily passage trends indicated few salmon passed the weir site before or after the operational period (Table 1; Appendices F1–F2).

Chinook Salmon

Abundance

Reported escapement of 2,918 Chinook salmon past the Tatlawiksuk River weir during the target operational period of 15 June through 20 September is considered a reliable estimate of the 2005 total annual escapement upstream of the weir (Table 1). Based on the available run timing and passage data, the 10-day inoperable period in September occurred well after the Chinook salmon run had ended (Table 1; Appendices B1 and F1). In addition, no radio tagged Chinook salmon were detected passing upstream of the weir before operations began or during inoperable periods (Stuby *In prep*).

Chinook salmon escapement in 2005 was the highest of 7 years observed at Tatlawiksuk River weir (Figures 5 and 6; Appendix B1), and was higher than the 1999 and 2000 escapements that contributed to the BOF classifying Kuskokwim River Chinook salmon as a stock of concern (Burkey et al. 2000). No formal escapement goals have been established for the Tatlawiksuk River, which precludes assessment of the adequacy of the escapement. However, in tributaries where escapement goals have been established (ADF&G 2004), escapement goals were met or exceeded in 2005, and have improved in recent years from below-average levels in 1998–2000 (Figure 6; Bergstrom and Whitmore 2004; Linderman et al. *In prep*).

The overall Kuskokwim River Chinook salmon escapement was considered above average in 2005 (Figure 6; Linderman et al. *In prep*). Kuskokwim River Chinook salmon escapement index was only slightly lower than in 2004, which was the highest year on record. Tatlawiksuk River Chinook salmon escapements are similar to most other escapement monitoring projects in the Kuskokwim River drainage, and have followed overall trends of low escapements in 1999 and 2000, intermediate escapements in subsequent years, and high escapements in 2004 and 2005 (Costello et al. 2006; Jasper and Molyneaux *In prep;* Stewart et al. *In prep;* Zabkar et al. *In prep*).

Implemented since 2001 as a response to the BOF classification of Kuskokwim River Chinook salmon as a stock of concern, the subsistence fishing schedule observed a 3-day weekly closure to allow large pulses of salmon passage through the river, likely contributing to higher escapements in recent years (Bergstrom and Whitmore 2004). In response to adequate run strength indicators for Chinook and chum salmon in 2005, the subsistence schedule was rescinded for the season on 19 June, before it had gone into effect for the entire drainage, thereby allowing unrestricted subsistence fishing effort (Linderman et al. *In prep*). However, Tatlawiksuk River Chinook salmon likely benefited from the schedule because June closures provided windows when fish could pass through the more intense lower Kuskokwim River subsistence fisheries.

For the second time since 2000, ADF&G permitted commercial fishing in District W-1 during 4 periods between 24 June and 1 July (Linderman et al. *In prep*). Additional commercial fishing periods were conducted during the coho salmon run. Only 4,784 Chinook salmon were reported in 2005 commercial salmon harvests compared with a recent 10-year average of 7,059 fish and a pre-2001 10-year average of 18,081 fish. The recent lack of a commercial market for Kuskokwim River chum salmon probably influenced Chinook salmon commercial harvests, since Chinook salmon are harvested incidentally with chum salmon. Considering the small commercial harvest, the impact of the subsistence fishery is undoubtedly much greater. An estimate is not yet available for the 2005 subsistence harvest, but the 1994–2003 average subsistence Chinook salmon harvest was 81,854 fish (Linderman et al. *In prep*). These harvests are in comparison to the 145,373 estimated to have migrated past the Aniak River in 2005 (Stuby *In prep*).

Run Timing at Weir

Run timing for Chinook salmon at Tatlawiksuk River weir in 2005 was similar to previous years with the exception of 1999, which was much later than all other years (Figure 5; Appendix F1). The median passage date in 1999 was 18 July, otherwise median passage dates ranged from 4 July in 2002 to 8 July in 2000. The median passage date in 2005 occurred on 7 July. Other Kuskokwim River projects reported Chinook salmon run timing earlier or similar to previous years in 2005 (Costello et al.2006; Jasper and Molyneaux *In prep*; Stewart et al. *In prep*; Zabkar et al. *In prep*).

Chum Salmon

Abundance

Reported escapement of 55,720 chum salmon past the Tatlawiksuk River weir during the target operational period of 15 June through 20 September is considered a reliable estimate of the 2005 total annual escapement (Table 1). Based on the available run timing and passage data, the 10 day inoperable period in September occurred well after the bulk of the chum salmon run had ended (Table 1; Appendices B2, F1).

The 2005 chum salmon escapement to Tatlawiksuk River was the highest on record, over twice that of 2004 (Figures 5 and 7; Appendix B2). Escapements have been determined for chum salmon in 6 of 8 years the project has operated; flood damage rendered the weir inoperable in 1998 and 2003. Similar to Tatlawiksuk River weir escapements, overall chum salmon escapements to Kuskokwim River tributaries have recovered from below-average levels in 1999 and 2000 to intermediate levels in recent years, and to record high levels in 2005, based on escapement data from several weir projects (Figure 7; Bergstrom and Whitmore 2004; Costello et al. 2006; Jasper and Molyneaux *In prep*; McEwen *In prep*; Roettiger et al. 2005; Stewart et al. *In prep*).

No formal escapement goals have been established for Tatlawiksuk River chum salmon, which precludes assessment of the adequacy of the escapement. However, escapement goals have been established for chum salmon at Aniak River sonar and Kogrukluk River weir (Figure 7; Whitmore et al. *In prep*; Molyneaux and Folletti 2005). Comparisons between Aniak River sonar and Kogrukluk River weir show common years of low escapement in 1999 and 2000 when goals were not achieved, and considerably higher escapements in subsequent years when goals were achieved or nearly achieved.

Implemented since 2001 as a response to the BOF classification of Kuskokwim River chum salmon as a stock of concern, the subsistence fishing schedule observed a 3-day weekly closure to allow large pulses of salmon passage through the river, likely contributing to higher escapements in recent years (Bergstrom and Whitmore 2004). In response to adequate run strength indicators for Chinook and chum salmon in 2005, the subsistence schedule was lifted for the season on 19 June before it had gone into effect for the entire drainage (Linderman et al. *In prep*). However, Tatlawiksuk River chum salmon likely benefited from the schedule because June closures provided windows when fish could pass through the more intense lower Kuskokwim River subsistence fisheries.

For the second time since 2000, ADF&G permitted commercial fishing in District W-1 during 4 periods between 24 June and 1 July (Linderman et al. *In prep*). Additional commercial fishing periods were conducted during the coho salmon run. Though the chum salmon commercial harvest in 2005 was about 3 times that reported in 2004, the reported harvest of 69,000 chum salmon was well below the recent 10-year average of 107,572 fish, and the pre-2001 10-year average of 286,134 fish. The recent lack of a commercial market for Kuskokwim River chum salmon has likely influenced commercial harvests. An estimate is not yet available for the 2005 subsistence harvest, but the 1994–2003 average subsistence chum salmon harvest estimate was 61,441 fish (Linderman et al. *In prep*). The effect of these fisheries on Tatlawiksuk River chum salmon escapements is likely modest, given the low harvests and the record chum escapements reported throughout the drainage (Costello et al. 2006; Jasper and Molyneaux *In prep*; McEwen *In prep*; Zabkar et al. *In prep*).

Run Timing at Weir

Chum salmon run timing was similar to previous years at Tatlawiksuk River weir (Figure 5; Appendix F1). Median passage dates have occurred between 10 and 18 July in past years, occurring on 15 July in 2005. The central 50% of the run occurred between 10 and 21 July, a period of 12 days, which is similar to past years. The first 25% of the run passed before 10 July, which was near the average of 8 July, and 75% of the run had passed by 21 July which is the historical average. Other Kuskokwim River projects observed median passage dates similar to previous years for chum salmon in 2005 (Costello et al. 2006; Jasper and Molyneaux *In prep*; McEwen *In prep*; Stewart et al. *In prep*; Zabkar et al. *In prep*).

Coho Salmon

Abundance

The reported escapement of 7,495 coho salmon past the Tatlawiksuk River weir during the target operational period of 15 June through 20 September is considered a reliable estimate of the 2005 total annual escapement (Table 1). The weir was operational well before the first coho salmon passed and only 773 coho salmon (10.3% of the overall coho salmon run) passed the weir during the 10 day inoperable period in September based on statistically valid estimation methods (Table 1).

The 2005 coho salmon escapement at Tatlawiksuk River weir was the lowest since 1999 (Figures 5 and 8; Appendix B3). Escapements have been determined in 5 of 8 years the project has operated; flood damage rendered the weir inoperable in 1998, 2000, and 2003. Coho salmon escapements are monitored at 5 other weir projects in the Kuskokwim River drainage, and a formal escapement goal exists only at Kogrukluk River weir (Figure 8; Linderman et al. *In prep*). The escapement goal was achieved at Kogrukluk River weir, but escapements were below most other years at every project (Costello et al. 2006; Jasper and Molyneaux *In prep*; Stewart et al. *In prep*; Zabkar et al. *In prep*).

Kuskokwim River coho salmon have not been identified as a stock of concern, even though harvests and escapements have generally been below average since 1996 (Whitmore et al.. 2005). Run abundance remained depressed until 2003, when record escapements were recorded (Figure 8). After several years of depressed runs, the commercial market was not positioned to fully exploit the unexpectedly strong coho salmon run in 2003. This problem was addressed in 2004 and 2005 when processing capacity was increased. Despite these changes, commercial harvest in 2005 was 142,319 coho salmon, which was well below the recent 10-year average of 302,383 fish and the pre-2001 10-year average of 453,755 fish (Linderman et al. *In prep*). Although below recent years, the 2005 commercial harvest may represent a higher exploitation rate considering the relatively low escapement observed at most projects in 2005 (Linderman et al. *In prep*).

Run Timing

Coho salmon run timing was later than previous years at Tatlawiksuk River weir, with the exception of 1999 (Figure 5; Appendix F2). The median passage date in 2005 was 24 August; median passage dates have ranged between 18 and 23 August in most past years, but occurred on 2 September in 1999. In 2005, the central 50% of the run occurred between 18 August and 3 September (17 days), a longer period than in past years. Historically, the central 50% of the coho salmon run occurred in 10–14 days at the Tatlawiksuk River weir. The first 25% of the run passed before 18 August, which was later than in 2001 and 2004, equal to 2002, and earlier than in 1999 when the coho salmon run arrived exceptionally late. By 3 September, 75% of the run had passed in 2005, which is later than in all years but 1999. Median passage dates at other Kuskokwim River projects relative to previous years were variable in 2005; they were near average at George and Kogrukluk river weirs, earlier than average at Tuluksak River weir, and later than average at Takotna River weir (Costello et al. 2006; Jasper and Molyneaux *In prep*; Stewart et al. *In prep*; Zabkar et al. *In prep*).

Other Species

Few sockeye salmon are observed in the Tatlawiksuk River, and the reported escapement of 77 sockeye salmon in 2005 was the highest on record. Historically, annual sockeye salmon escapement at the Tatlawiksuk River weir has ranged from 0 fish in 2000 to 10 fish in 2004, which is not surprising since the Tatlawiksuk River is not a primary spawning tributary for sockeye salmon. Record high sockeye salmon escapements were reported at all other Kuskokwim River projects in 2005 (Figure 9; Linderman et al. *In prep*). The 2005 sockeye salmon commercial harvest of 27,645 sockeye salmon was greater than the recent 10-year average of 23,763 fish (Linderman et al. *In prep*). Compared to other species in the drainage, little is known about sockeye salmon in the Kuskokwim River. No escapement goals exist for this species within the drainage.

Pink salmon are occasionally observed in the Tatlawiksuk River, but only in small numbers (0 to 3 observed annually at the weir). The Tatlawiksuk River is not a primary spawning tributary for pink salmon; therefore, it is not surprising that only one pink salmon was observed in 2005.

Other species commonly observed at Tatlawiksuk River weir include longnose suckers, whitefish, Arctic grayling, and northern pike (Appendix C1). Longnose suckers are historically the most abundant resident species counted at the Tatlawiksuk River weir. The highest recorded passage of this species was 5,093 fish in 1999. However, abundance estimates are incomplete because smaller individuals may be able to pass freely between the pickets, and upstream migration appears to start well before weir operations begin. A total of 1,359 longnose suckers were counted upstream through the weir in 2005, and most of these were observed in the first 10 days of operations in June. Large numbers of longnose suckers were observed migrating downstream along with whitefish species in August and September, suggesting these fish migrated upstream prior to operations in 2005.

Carcasses

Carcasses recovered at the Tatlawiksuk River weir included less than 1% of the Chinook salmon escapement and 2.4% of the chum salmon escapement, both of which are less than in all previous years (Figures 10 and 11). The remainder of the spawned-out fish were likely retained in or near the river upstream of the weir for a protracted period of time, thereby contributing to the productivity of the system through the addition of marine derived nutrients as described by Cederholm et al. (1999; 2000). Nutrient retention within a system is essential for the continuation of strong salmon runs.

Record low water levels in July and August may account for the low numbers of carcasses observed in 2004 and 2005, but the relationship between water levels and carcass numbers is not clear (Figure 11). Additionally, this assessment is confounded by the installation of downstream passage chutes in recent years that may provide pathways for carcasses to wash over the weir.

Of other species, 6 male sockeye salmon and 17 coho salmon carcasses were recovered on the weir. However, the weir was removed before the majority of coho salmon had completed spawning, so no conclusions have been made about the occurrence or retention of coho carcasses.

AGE, SEX, AND LENGTH COMPOSITION

Chinook Salmon

ASL data collected from Chinook salmon in 2005 were adequate to describe the composition for total escapement. Sampling occurred throughout the run and total sample size met or exceeded the minimum goal for each pulse. ASL composition has been estimated for the total Chinook escapement in only 3 of 8 years the project has operated. Flood damage resulting in premature project termination was cited in 2 of those years, and problems collecting the minimum ASL sample size were cited in other years (Linderman et al. 2002; Stewart and Molyneaux 2005). Increased abundance and improved sampling techniques have resulted in adequate sample collections in 2002, 2004, and 2005. Although “active sampling” has become an effective means of capturing adequate numbers of Chinook salmon for ASL collection, this strategy creates more crew activity around the weir, and as a result Chinook salmon sometimes move back downstream. This behavior is especially evident in low water conditions, and pulse sample collection must sometimes be abbreviated to prevent an abnormal delay in fish passage.

In 2005, the percentage of age-1.2 and -1.3 Chinook salmon decreased and the percentage of age-1.4 Chinook salmon increased at the Tatlawiksuk River weir as the season progressed (Figure 12; Table 2). This is consistent with Tatlawiksuk River Chinook salmon data combined over all years (Figure 12) and with trends observed at other locations in the drainage (Costello et al. 2006; Jasper and Molyneaux *In prep*; Stewart et al. *In prep*; Zabkar et al. *In prep*), although it was the opposite of the 2 years when sufficient data were collected to estimate the ASL composition of the entire Chinook salmon escapement. Generally, for all escapement projects the contribution of age-1.3 Chinook salmon to overall escapement tends to decrease throughout the run (Molyneaux et al. *In prep*). Notably, in 2005 this trend was not apparent at George and Tuluksak river weirs, emphasizing the high variability among weir projects. The percentage of age-1.4 Chinook salmon tends to increase during the run at most escapement projects, but this pattern is less prevalent and is often masked by the abundance of less common age classes (e.g. age-1.1, -1.2, and -1.5 fish).

The proportion of age-1.2 Chinook salmon in 2005 was the lowest on record for the Tatlawiksuk River weir, whereas the proportion of age-1.3 Chinook salmon has increased each year (Figures 13 and 14). The number of age-1.4 Chinook salmon in 2005 was similar to past years, but the proportion to total annual escapement was much lower than in 2002. Age-1.5 Chinook salmon have comprised only a small percentage of annual escapements at Tatlawiksuk River weir, ranging from 0 to 3.6%.

Age compositions in 2005 at the Tatlawiksuk River weir were comparable with most other escapement monitoring projects in the Kuskokwim River drainage. Similar to Tatlawiksuk River weir, George River weir had a lower proportion of age-1.2 Chinook salmon in 2005 compared to previous years (Stewart et al. *In prep*). However, Kogrukluk and Tuluksak river weirs had near average proportions of age-1.2 Chinook salmon in 2005 (Jasper and Molyneaux *In prep*; Zabkar et al. *In prep*). The proportion of age-1.3 Chinook in 2005 was higher than usual at all other weir projects in the drainage, with the most extreme disparities at George and Tatlawiksuk river weirs. Similar to Tatlawiksuk River weir, most other projects reported lower than average proportions of age-1.4 Chinook in 2005 (Costello et al. 2006; Jasper and Molyneaux *In prep*; Stewart et al. *In prep*; Zabkar et al. *In prep*). As in past years, the proportions of other age classes of Chinook salmon were low at all locations in 2005, and the relative contribution varied among projects (Figure 13; Molyneaux et al. *In prep*).

The unusually high numbers of age-1.2 Chinook salmon in 2004 and age-1.3 Chinook salmon in 2005 at most Kuskokwim River projects is an indication of strong sibling relationships in Kuskokwim River Chinook salmon (Costello et al. 2006; Jasper and Molyneaux *In prep*; Stewart et al. *In prep*; Zabkar et al. *In prep*). These high numbers were unexpected because escapements in the 2000 parent year were generally low (Harper and Watry 2001; Linderman et al. 2002; 2003; Schwanke et al. 2001; Ward et al. 2003). Since few smolt studies are currently conducted on the Kuskokwim River, it is impossible to determine whether the strong returns resulted from favorable ocean conditions and/or favorable river conditions. However, the wide range of the phenomenon in the Kuskokwim River drainage indicates that favorable ocean conditions were probably the driving force. Furthermore, results from juvenile surveys conducted in the Takotna River drainage in 2001 do not suggest high survivability among juveniles during the 2000–2001 winter because juvenile Chinook salmon were found in low concentrations relative to 2002 and 2003 (Schwanke and Molyneaux 2002; Costello et al. 2006). The high abundance of both age-1.2 Chinook salmon in 2004 and age-1.3 Chinook salmon in 2005 at Tatlawiksuk River weir and other tributaries in the drainage may foretell strong returns of age-1.3 and -1.4 Chinook salmon in 2006. Since age-1.4 is typically a prominent age class in the Tatlawiksuk River, a high return of Chinook salmon to the Tatlawiksuk River is expected for 2006.

The percentage of females at Tatlawiksuk River weir in 2005 was higher, at 43%, than in previous years (Molyneaux et al. *In prep*). Similar to previous years, the percentage of females tended to increase as the run progressed (Figure 15; Table 2). This finding was expected since male salmon are reported to migrate earlier than female salmon, and is commonly observed throughout the Kuskokwim River drainage (Molyneaux et al. *In prep*). The percentage of female Chinook salmon was average or slightly below average at most other locations where samples were taken in 2005 (Costello et al. 2006; Jasper and Molyneaux *In prep*; Stewart et al. *In prep*; Zabkar et al. *In prep*).

Mean lengths for male and female age-1.3 Chinook salmon in 2005 were similar to 2002 and 2004, which were the only years with adequate sample sizes to estimate the age composition of the entire run (Figure 16). The mean length for male age-1.4 Chinook salmon was similar to 2004, but greater than in 2002, while the mean length for female age-1.4 Chinook salmon was significantly less than in 2004, but similar to that in 2002. The average length of age 1.2 male Chinook salmon and age-1.3 and -1.4 male and female Chinook salmon have varied little in the 3 years with sufficient data for comparison (Figures 16 and 17; Molyneaux et al. *In prep*).

Tatlawiksuk River Chinook salmon exhibited length partitioning by age class for male and female fish, a pattern commonly observed throughout the Kuskokwim River drainage (Figure 17; Table 3). As expected, length increased with age. No age 1.2 female Chinook salmon were sampled in 2005, but mean lengths of age 1.2 male Chinook salmon increased slightly as the run progressed. Mean lengths of age 1.3 and age 1.4 Chinook salmon remained fairly steady during the duration of the run, for both male and female fish. Female Chinook salmon were generally larger, on average, in both age classes (Figure 17).

Chum Salmon

ASL data collected from chum salmon in 2005 were adequate for describing the age composition for the total annual escapement. Sampling occurred throughout the run and total sample size met or exceeded the minimum goal for each pulse. ASL composition has been estimated in 6 of 8 years the project has operated. Flood damage precluded estimations in 1998 and 2003.

Age-0.3 chum salmon were higher in abundance and proportion to escapement in 2005 than all previous years observed, which is consistent with the disproportionately high abundance of age 0.2 chum salmon in 2004 considering that both populations are from the same cohort (Figures 13 and 14; Table 4; Molyneaux et al. *In prep*). The number of age-0.2 chum salmon was higher than all years except 2004, but their relative contribution to escapement was not unusual. The abundance of age-0.4 chum salmon was not unusual in 2005, but the relative abundance of that age class to overall escapement was by far the lowest in the project's history. Record high abundances of age-0.3 fish were observed in all other monitored tributaries in 2005, as well as above average abundances of age-0.2 fish, with the exception of George River weir (Molyneaux et al. *In prep*; Stewart et al. *In prep*). This coupled with the above average escapement in 2002 indicates the potential for a strong return of age-0.3 and -0.4 chum salmon in 2006.

The dominance of the age-0.3 chum salmon in 2005 at the Tatlawiksuk River weir was similar to 1999 and 2002 (Figures 13 and 14; Table 4). The proportion of age-0.4 fish was unusually low throughout the chum salmon run in 2005, and their relative contribution to escapement decreased fairly steadily (Table 4; Figure 18). Usually at Tatlawiksuk River weir and at other Kuskokwim River projects, the proportion of age-0.3 chum salmon increases as the run progresses, while the proportion of age-0.4 fish diminishes (Figure 18; Table 4) (DuBois and Molyneaux 2000;

Molyneaux et al. *In prep*). The unusual abundance of age-0.2 chum salmon and the tendency of the proportion of age-0.2 fish to increase during the run have masked that trend in recent years, especially for age-0.3 fish. In fact, the percentage of age-0.4 chum salmon has decreased during each season the Tatlawiksuk River weir has operated and during most years at other projects in the drainage where chum salmon samples are collected (Costello et al. 2006; Jasper and Molyneaux *In prep*; Stewart et al. *In prep*; Zabkar et al. *In prep*).

Based on ASL data, 58.1% of the total annual chum salmon escapement at Tatlawiksuk River was comprised of females in 2005, which is significantly higher than the previous average of 47.7%. Historically, the percentage of females has ranged from 38.7% to 52.6% (Molyneaux et al. *In prep*). Of the other projects in the drainage, only Kogrukluk River weir had an unusually high female sex ratio in 2005. Sex ratios at all other projects in the drainage were near average in 2005 (Molyneaux et al. *In prep*). In 2005, the percentage of females tended to increase as the run progressed, which is typical at the Tatlawiksuk River weir and other escapement monitoring projects in the Kuskokwim (Table 4; Figure 15; DuBois and Molyneaux 2000). However, females comprised only 32.0% of the chum salmon carcass count, compared to 58.1% of the upstream migrants. This reinforces that sex composition derived from weir carcass counts is biased low for females (DuBois and Molyneaux 2000).

Mean lengths for both male and female age-0.3 chum salmon in 2005 were nearly identical to those observed in 2004, but both were significantly less than in past years (Figure 19). The mean length of female age-0.3 chum salmon in 2005 was similar to those observed in past years, except for in 1999 and 2000 when mean length tended to be greater. Mean lengths for male and female age-0.4 chum salmon were similar to past years, considering the small sample sizes and large 95% confidence intervals (Figure 19). For both male and female chum, length increased with older age classes (Table 5; Figure 20).

Length partitioning occurs between sex and age class at Tatlawiksuk River weir (Table 5; Figure 20). Males tended to be longer than females, and mean lengths increased with age, most noticeably among males. Age-0.2 and -0.3 males, and age-0.3 females were shorter in 2005 than in most previous years, but age-0.4 males and age-0.2 and -0.4 females were larger. Overall, however, mean lengths in 2005 were near the historical average (Figures 19 and 20).

Coho Salmon

The ASL data collected from coho salmon in 2005 were adequate for describing the age composition for the total annual escapement. Sampling occurred throughout the run and total sample size met or exceeded the minimum goal. ASL composition has been estimated in 5 of 8 years the project has operated. Flood damage precluded estimations in 1998, 2000, and 2003.

The proportions of age-2.1 and -3.1 coho salmon were near historical average of 91.7% and 5.6%, respectively (Figure 13; Table 6). Age-1.1 coho salmon typically comprise only a small percentage of escapements to the Tatlawiksuk River, but the proportion of age-1.1 coho salmon in 2005 was greater than the historical average of 2.7% (Table 6). Age composition remained fairly consistent over the 2005 season, similar to previous years at Tatlawiksuk River weir, and similar to other locations in the Kuskokwim River drainage (Table 6; Molyneaux et al. *In prep*).

Based on ASL data, 48.2% of the annual coho salmon escapement was comprised of females in 2005 (Figure 15), which is usual for the Tatlawiksuk River, and similar to other projects in the drainage (Molyneaux et al. *In prep*). Historically, the percentage of females has ranged from a low of 38.7% in 2002 to a high of 52.1% in 2001 (Molyneaux et al. *In prep*). Similar to previous years, seasonal trends indicate the ratio of female fish increased slightly over the run in 2005 (Figure 15). The percentage of females is typically around 40-50% in Kuskokwim River tributaries where samples are routinely collected, and the percentages typically increase slightly throughout the run in most locations (Costello et al. 2006; Stewart et al. *In prep*; Zabkar et al. *In prep*). One chronic exception is in the Kogrukluk River where the percentage of females is typically lower than other areas (30-40%) and the intra-seasonal sex composition is highly variable between years (Jasper and Molyneaux *In prep*; Molyneaux et al. *In prep*).

The mean length of male age-2.1 coho salmon in 2005 was similar to that in past years with the exception of 2001 when mean length tended to be greater (Figure 21). The mean length of female age-2.1 coho salmon in 2005 was similar to most past years, but significantly greater than in 2004, and significantly less than in 2001 (Figure 21). Similar to past years, average length-at-age varied little between sexes (Table 7; Figure 20). Length partitioning does not appear to occur between sexes in age-2.1 fish, and mean length of this age class was near average in 2005 (Figures 20 and 21). Mean lengths increased only slightly over the season for coho salmon at Tatlawiksuk River weir (Table 7).

WEATHER AND STREAM OBSERVATIONS

Daily average water levels (discharge) in the Tatlawiksuk River were well below average for most of the 2005 season, and below the historical daily minimum for all of July and most of August (Figure 22; Appendix E1). Water level increased rapidly from 20 August to about 10 September, exceeding the historical daily average by about 6 September, and nearly reached the historical daily maximum by about 10 September. Consequently, water level was on the rise for nearly the entire coho salmon run, beginning from a level far below the historical daily minimum and reaching a seasonal maximum near the historical daily maximum. Still, it is difficult to determine whether the rising water level affected coho salmon migration; the run timing of coho salmon in 2005 was not unusual. The relation of water level to fish passage is not well understood and varies among sites and species (Quinn 2005). At Tatlawiksuk River weir, however, water level does not appear to significantly affect upstream salmon passage (Figure 23). However, this assessment ignores the possible effects of ASL sampling activity.

Water temperature at the Tatlawiksuk River weir was well above average for most of the season, exceeding the historical daily maximum for about 2 weeks in late July and early August (Figure 22). Mean daily water temperatures were below average for a 2 week period in late August and early September, which coincides with a period of heavy precipitation and a rapid and continual water level increase (Figure 22; Appendix E1). Any relationship between stream temperature and passage strength or timing is not easily discernable by the available data (Figure 24). The effect of migration timing does change in relation to long term changes in freshwater water temperatures (Quinn 2005).

The two methods for determining daily average water temperature at the Tatlawiksuk River weir yielded similar results in 2005 (Figure 25; Appendices E1–E2). Daily average water temperatures derived from both methods paralleled each other for most of the season, but the daily average water temperature determined from twice-daily observations was about 1° C cooler than the average of the hourly readings recorded by the data logger. The data logger is likely more accurate and its use should continue in future years.

Knowledge of environmental conditions and a commitment to long-term monitoring may be valuable in understanding migration and survival. Quinn (2005) notes that migration in salmon is likely controlled by genetic factors as an adaptation to long-term average environmental conditions. Keefer et al. (2004) found a positive correlation between river discharge and run timing of Columbia River Chinook salmon stocks, and that Columbia River sockeye salmon have started their inriver migration 2 weeks earlier in response to warmer water conditions resulting from dam construction (Keefer et al. 2004). We cannot begin to assess the affects of changing environmental conditions on Kuskokwim River salmon without the relatively complete weather and stream observations collected by weir crews such as at the Tatlawiksuk River. These measurements can easily be neglected in field camps, and may seem a low priority among project objectives, but incorporating weather and stream observations into the daily morning and afternoon radio schedules with ADF&G staff in Bethel helps insure the data are gathered consistently throughout the season.

RELATED PROJECTS

Inriver Abundance of Chinook Salmon in the Kuskokwim River

The data obtained from the Chinook salmon radiotelemetry project conducted on the mainstem Kuskokwim River offered an opportunity to study migration characteristics of Tatlawiksuk River Chinook salmon in 2005. A total of 12 radio tagged Chinook salmon were detected migrating past the weir in 2005 (Stuby *In prep*). The distribution of tags detected relative to passage at the weir indicates that the Tatlawiksuk River Chinook salmon run was well represented in the tagging sample, despite the few tags observed (Figure 26; Stuby *In prep*).

Results from the Chinook salmon radiotelemetry study suggest that, of the stocks investigated, Tatlawiksuk River Chinook are among the earliest to migrate past the Kalskag tagging sites, despite its relatively central location in the drainage (Figures 27–29; Stuby *In prep*). In 2005, the median passage date for tagged Tatlawiksuk River-bound Chinook salmon past the Kalskag tagging site was earlier than for tagged fish bound for all other tributaries, except for those fish heading to the Upper Kuskokwim/Takotna rivers, which are locations much further upriver, and the Stony/Swift rivers, which confluence only a short distance downstream. Historical data suggest an inverse relationship between the distance upriver and the timing of Chinook salmon stocks through the lower river; those fish bound for the furthest upriver spawning locations travel through the lower river earlier than those bound for middle or lower river tributaries. Though sample sizes are small, the median passage dates for tagged Tatlawiksuk River-bound Chinook salmon past the tagging sites have been the earliest of any stock in 2 of the 4 years with comparable data, and later than only the Takotna/Upper Kuskokwim river (locations much further upstream) fish 1 year (Figures 27 and 28). Though the actual river distance to the Kogrukluk River is significantly greater than to the Tatlawiksuk River, Kogrukluk River Chinook salmon stocks continue to contradict the theory that the timing of stocks through the lower river depends on the distance to the spawning grounds, which is a trend more apparent in chum salmon (Figures 30 and 31). Instead, the run timing of discreet Chinook salmon stocks through the lower river may depend on the distance up the Kuskokwim River they travel, not the total distance to the spawning grounds. Fish bound for the Tatlawiksuk, Stony, and Swift rivers travel further up the mainstem Kuskokwim than Kogrukluk River stocks.

Similar to past years, the average speed of radio tagged Chinook salmon from the tagging sites to initial detection at the Tatlawiksuk River weir was about 27.6 km per day in 2005. This speed was similar to Chinook salmon returning to the Kogrukluk and George rivers. It took an additional 0.7 to 18.8 days for the fish to pass through the weir after initial detection by the receiver station. The average duration of 6.7 days at the Tatlawiksuk River weir is in contrast to 1.9 and 2.2 days exhibited at Kogrukluk (ignoring the 2 fish that did not move past the weir) and George river weirs, and may account for the appearance of a longer transit time among anchor tagged Chinook salmon (L. Stuby, Sport Fish Biologist, ADF&G, Fairbanks; personal communication). The longer transit time from initial detection to weir passage at Tatlawiksuk River weir is not yet understood, but may be due to environmental differences among rivers, differences in receiver station function, or an actual delay caused by the weir or ASL sampling activity. Similar to past years, Tatlawiksuk River weir had a much lower relative abundance of Chinook salmon than George or Kogrukluk river weirs, requiring longer ASL sampling sessions that may affect the behavior of Chinook salmon around the weir.

The Chinook salmon radiotelemetry project provides valuable data for fishery management. The timing of commercial fishery openings and the annual discontinuation of the subsistence fishing schedule is considered with respect to the stock-specific run timing evident through the tagging and tracking of Chinook salmon. In 2005, the date of the first commercial opening in District W-1 (24 June) probably occurred after the bulk of the fish bound for the Tatlawiksuk River and other upper river tributaries had moved through the lower portions of the Kuskokwim River drainage. Tatlawiksuk River Chinook salmon captured at the tagging sites likely exited the commercial fishing district 2–3 days before their capture at the tagging sites, assuming their travel speed remained constant along their migration path from the lower river to the upper river (Figures 27 and 28; L. Stuby, Sport Fish Biologist, ADF&G, Fairbanks; personal communication). The timing of Tatlawiksuk River Chinook salmon through the lower river, coupled with the modest Chinook salmon harvest in 2005, made it unlikely that many Tatlawiksuk River Chinook salmon were harvested in the commercial fishery. However, the subsistence fishing schedule likely benefited Tatlawiksuk River Chinook salmon stocks; radiotelemetry data suggest that by the time the subsistence fishing schedule was rescinded on 19 June, most of the Chinook salmon bound for upper river tributaries (such as the Tatlawiksuk River) had migrated past the lower river where subsistence fishing is most intense (Figures 27 and 28).

Kuskokwim River Sockeye Salmon Radiotelemetry Feasibility Study

Details about the Kuskokwim River sockeye radiotelemetry pilot project are discussed by Gilk (*Unpublished*). Preliminary results suggest that few Kuskokwim River sockeye salmon are found upstream of the Stony River drainage based on passage data from a receiver station located at Sinka's Landing (11 rkm downstream of the Tatlawiksuk River). This project was a pilot study, however, and a more extensive project proposed for 2006 will yield more solid conclusions.

Kuskokwim River Salmon Mark–Recapture Project

The Tatlawiksuk River weir project contributed successfully to the *Kuskokwim River Salmon Mark–Recapture Project*. Tag numbers were recovered from 92% of the anchor tagged fish observed at the Tatlawiksuk River weir in 2005. The Kuskokwim River mainstem tagging project afforded an opportunity to study migration characteristics of Tatlawiksuk River Chinook, chum, sockeye, and coho salmon in 2005. Details are discussed by Pawluk et al. (*In prep* b).

Chinook Salmon

Tag numbers were recovered from all 4 anchor tagged Chinook salmon observed passing the Tatlawiksuk River weir in 2005. The percentage of tagged fish in the total annual Chinook salmon escapement past the Tatlawiksuk River weir (0.3%) was similar to that reported for George River weir (0.2%), Kogrukluk River weir (0.3%), and Takotna River weir (0.4%; Pawluk et al. *In prep* b). The distribution of tags detected relative to passage at the weir indicates that the Tatlawiksuk River Chinook salmon run was well represented in the tagging sample, despite the few number of tags observed (Figure 26; Pawluk et al. *In prep* b).

Anchor tagged Chinook salmon bound for the Tatlawiksuk River exhibited travel speeds of about 22.9 km per day, considerably slower than the travel speed exhibited by the radio tagged Chinook salmon (Pawluk et al. *In prep* a; Stuby *In prep*). This is expected, however, because the travel time for the radio tagged Chinook salmon is calculated from tagging to initial detection at the receiver station, while the travel time for anchor tagged fish is calculated from tagging to weir passage. Radio tagged Chinook salmon can be within the range for detection long before they pass through the weir. This duration can be quite variable, ranging from an average of 1.9 days at Kogrukluk River weir to 6.7 days at Tatlawiksuk River weir (Costello et al. 2006; Jasper and Molyneaux *In prep*), and may account for the apparently slower travel speed among anchor tagged Chinook salmon compared to those radiotagged.

Similar to the findings of the Chinook salmon radiotelemetry project, anchor tagged Tatlawiksuk River Chinook salmon are among the earliest to migrate past the Kalskag tagging sites, despite the relatively central location of the Tatlawiksuk River in the drainage (Figure 32; Pawluk et al. *In prep* b). Run timing of discrete Chinook salmon stocks past the Kalskag tagging sites in 2005 based on anchor-tag deployment mirrored the timing determined from the radio tagging study, and supports the idea that conservation measures, especially in June, benefit Tatlawiksuk River Chinook salmon stocks (Figures 27, 28, and 32).

Chum Salmon

Tag information was collected from 161 of the 170 tagged chum salmon observed passing the weir in 2005 (Pawluk et al. *In prep* b). The percentage of tagged fish in the total annual chum salmon escapement past the Tatlawiksuk River weir (0.3%) was much lower than that reported for George River weir (2.2%), but slightly higher than that reported for Takotna River weir (0.1%), and Kogrukluk River weir (0.1%; Pawluk et al. *In prep* b). Still, the distribution of tags detected relative to passage at the weir indicates that the Tatlawiksuk River chum salmon run was well represented in the tagging sample, despite the small sample size (Figure 33; Pawluk et al. *In prep* b).

Results from the tagging study offered an opportunity to investigate stock-specific run timing past the tagging sites and migratory behavior of discrete chum salmon spawning aggregates. Based on tagging data, the median passage date of Tatlawiksuk River chum salmon past the tagging sites was 7 July in 2005 (Figures 30 and 31). In every year of the tagging study, data indicate that Tatlawiksuk River chum salmon are among the first to migrate past the tagging sites (Figures 30 and 31). The transit time from tagging to weir passage ranged from 6 to 15 days in 2005, with an average of 8.6 days. Considering the distance from the tagging sites, anchor tagged chum salmon averaged 35.7 km per day, which is similar to the 33.1 km per day in 2004 and 37.3 km per day in 2002. The travel speed of Tatlawiksuk River-bound chum salmon was similar to the observed speeds of 32.2, 33.8, and 38.8 km per day at George, Kogrukluk, and Takotna river weirs, respectively.

The *Kuskokwim River Salmon Mark–Recapture Project* provides valuable data for the management of chum salmon by providing managers a better understanding of the run timing of discrete chum salmon stocks through the lower river. When considering opening the commercial fishery or terminating the subsistence fishing schedule for the season, managers look to historic run timing indicators and evidence from the Kuskokwim River tagging study. In 2005, the commercial fishery was first opened on 24 June, after most run assessment tools indicated strong returns to the Kuskokwim River (Linderman et al. *In prep*). Historic tagging data indicate that the 4 commercial fishing periods between 24 June and 1 July occurred before the bulk of the chum salmon bound for the Tatlawiksuk River were migrating through the lower river (Figures 30 and 31). In fact, in each year of the Kuskokwim River tagging study, tag numbers recovered from chum salmon at the Takotna River weir reveal that the bulk of chum salmon bound for the Tatlawiksuk River pass the Kalskag/Aniak tagging sites during the last 2 weeks of June and first 2 weeks of July (Figures 29 and 31). The additional time required to transit the distance between District W-1 and the tagging sites is not enough to ensure that Tatlawiksuk River chum salmon had migrated beyond the commercial fishing area by the time of the first opening; it would take only about 3 days for chum salmon to travel this distance assuming that travel speed remains relatively constant along the chum salmon migration path from the lower river to the upper river (Stewart and Molyneaux 2005). However, the effect of the commercial openings on Kuskokwim River chum salmon stocks was likely negligible in 2005 because the harvest was only a small fraction of the total run to the Kuskokwim River, as evidenced by the record breaking escapement observed at most monitored locations in 2005 (Figure 7; Linderman et al. *In prep*).

The subsistence fishing schedule probably had little effect on most Kuskokwim River chum salmon stocks in 2005. Tagging data suggest that the schedule was rescinded well before the bulk of the overall chum salmon run had entered the area of greatest subsistence fishing effort, and well before Tatlawiksuk River chum salmon entered the river in 2005 (Figures 5, 30, and 31; Pawluk et al. *In prep* a).

Coho Salmon

Tag information was collected from 31 of the 32 tagged coho salmon observed passing the weir in 2005 (Pawluk et al. *In prep* b). The percentage of tagged fish in the total annual Chinook salmon escapement past the Tatlawiksuk River weir (0.5%) was lower than that reported for George River weir (1.0%), Kogrukluk River weir (0.9%), and Takotna River weir (0.7%; Pawluk et al *In prep* b), and the distribution of tags detected relative to passage at the weir indicates either the early portion of the Tatlawiksuk River coho run was missed in the tagging sample, or transit time was somewhat longer for tagged fish than non-tagged fish (Figure 34; Pawluk et al. *In prep* b).

Results from the tagging study offered an opportunity to investigate stock-specific run timing past the tagging sites and migratory behavior of discrete coho salmon spawning aggregates. Based on tagging data, the median passage date of Tatlawiksuk River coho salmon past the tagging sites was 17 August in 2005 (Figures 35 and 36). Still, in every year of the tagging study, tagging data indicate that Tatlawiksuk River coho salmon migrate through the lower river during the peak of the overall coho salmon run, though the timing between coho salmon stocks tends to be more compacted compared to other species (Figures 35 and 36). The transit time between tagging and passage at the weir ranged from 7 to 31 days, with an average of 14.8 days. This is considerably less than the 19 days in 2004, but similar to the 14 day average transit time observed for coho salmon in 2002 (Kerkvliet et al. 2003; Pawluk et al. *In prep* a). The similarity between 2002 and 2005 may be due to similar stream flow conditions; both years reported flooding events in late August and early September. Water levels in 2004 were unusually low during the coho salmon run, which may be responsible for the longer transit time (Stewart and Molyneaux 2005). Considering the distance from the tagging sites, anchor tagged coho salmon averaged 22.3 km per day in 2005, which is similar to the 21.3 km per day observed in 2002, but much faster than the 15.7 km per day observed in 2004. The travel speed of Tatlawiksuk River coho salmon was similar to the observed speeds of 19.8 and 23.7 km per day at the George and Kogrukluk rivers, but considerably slower than the 26.1 km per day observed at Takotna River. Based on migratory speeds for these 4 tributaries, it appears that the fish with the longest migration distance travel faster to their destination, as was the case in 2005.

The *Kuskokwim River Salmon Mark–Recapture Project* provides valuable data for the management of coho salmon by providing managers a better understanding of the run timing of discrete coho salmon stocks through the lower river. In 2005, 11 commercial fishing periods were conducted between 2 August and 1 September, during the time that most of the coho salmon bound for the Tatlawiksuk River were believed to be migrating through the lower portion of the Kuskokwim River based on evidence from the tagging study (Figures 35 and 37; Pawluk et al. *In prep* b). The additional time required to transcend the distance between District W-1 and the tagging sites is not enough to ensure that Tatlawiksuk River coho salmon had migrated beyond the commercial fishing area by the time of the first coho salmon-directed opening; it would take only about 3 days for coho salmon to travel this distance assuming that travel speed remains relatively constant along the chum salmon migration path from the lower river to the upper river (Pawluk et al. *In prep* b). However, the effect of the commercial openings on Tatlawiksuk River coho salmon stocks is unknown, but was probably minimal given the relatively small harvest in 2005 and the widespread distribution of coho salmon in the Kuskokwim River (Linderman et al. *In prep*).

Sockeye Salmon

Tag information was collected from all 3 of the tagged sockeye observed passing the weir in 2005 (Pawluk et al. *In prep* b). In 2005, the percentage of tagged fish in the total annual sockeye salmon escapement past the Tatlawiksuk River weir (4.1%) was similar to the 6.3% and 5.7% reported for George and Takotna river weirs but relatively high compared to the percentage observed at Kogrukluk River weir (0.6%; Pawluk et al. *In prep* b). The distribution of tags relative to weir passage indicated that the sockeye salmon run to the Tatlawiksuk River was reasonably well represented in the tagging sample, despite the small sample size (Figure 38; Pawluk et al. *In prep* b).

The tagging data offered an opportunity to study migration characteristics of the unusual escapement of sockeye salmon at the Tatlawiksuk River in 2005. The transit time between tagging and passage at the weir ranged from 11 to 15 days, with an average of 12.3 days. Considering the distance from the tagging sites, anchor tagged sockeye salmon averaged 24.7 km per day in 2005, which is similar to the observed speeds of 24.0 and 26.2 km per day at George and Kogrukluk river weirs, but much slower than the 40.2 km per day at Takotna River weir, though there were only 2 tagged sockeye reported from this location. Comparisons between years are not possible because sockeye salmon are rare in the Tatlawiksuk River.

Results from the tagging study suggest that Tatlawiksuk River sockeye salmon passed through the lower river during the peak of the overall sockeye salmon run from 2002 to 2005, though sample sizes are limited (Figures 37 and 39). Comparatively little is known about sockeye salmon in the Kuskokwim River and escapement goals have not been established, precluding the necessity of management actions.

Genetic Diversity of Chinook Salmon from the Kuskokwim River

Crew at the Tatlawiksuk River weir succeeded in collecting 100 Chinook salmon genetics samples to be added to the study of genetic diversity in the Kuskokwim River drainage. Based on micro satellite DNA and allozymes markers, past evaluations found evidence of genetic distinctions between upper, middle, and lower Kuskokwim River Chinook salmon populations (Templin et al. 2004).

CONCLUSIONS

ESCAPEMENT MONITORING

- The weir was installed by 12 June and was operational until 23 September, with the exception of a 10-day inoperable period from 10 to 19 September. The effect of the two holes discovered during the season is probably negligible.
- Total annual Chinook salmon escapement in 2005 was a modest increase over 2004, and the highest on record, which was similar to the trends seen in most other Kuskokwim River tributaries with comparable data sets.
- Total annual chum salmon escapement in 2005 was the highest on record, which is consistent with most other tributaries in the drainage, but the increase from 2004 was proportionally lower than the increases seen in most other Kuskokwim River tributaries.
- Total annual coho salmon escapement in 2005 was a significant decrease from 2004, which is similar to other Kuskokwim River tributaries and the lowest since 2000.

AGE, SEX, AND LENGTH COMPOSITION

- The number of age-1.3 Chinook salmon in the Tatlawiksuk River escapement was unusually high in 2005, but expected given the high abundance of age-1.2 Chinook salmon in 2004, and may foretell an abundant return of the more dominant age-1.4 cohort to the Tatlawiksuk River in 2006.
- The number of age-0.3 chum salmon in the Tatlawiksuk River escapement was unusually high in 2005, as was expected given the unusually high abundance of age-0.2 chum salmon in 2004, and may foretell an abundant return of age-0.4 cohort to the Tatlawiksuk River in 2006. Similar to 2004, the number of age-0.2 chum salmon in the Tatlawiksuk River escapement was unusually high in 2005, consistent with most other Kuskokwim River projects, and may foretell an abundant return of the more dominant age-0.3 cohort to the Kuskokwim River in 2006.
- Despite relatively low parent year escapements, the abundance of the dominant age classes in both Chinook and chum salmon in 2005 suggests continued favorable ocean

survivability over the conditions that led to the low runs to the Kuskokwim River in 1998, 1999, and 2000.

- Coho salmon escapement in 2005 was dominated by age-2.1 fish, which is normal for Kuskokwim River tributaries. Coho salmon generally return as age-2.1 fish, so the predictive value of sibling relationships is limited.
- The percentage of female Chinook and chum salmon in the overall escapements was unusually high in 2005, but the percentage of female coho salmon in the overall escapement was near average.
- Chinook salmon were similar in length to past years in every age and sex category. Male age-0.3 chum salmon were generally smaller in 2005 than in most past years, but lengths for other age and sex categories were similar to most past years. Age-2.1 coho salmon (male and female) were similar in length to past years.

WEATHER AND STREAM OBSERVATIONS

- For most of the 2005 season, daily water levels were at or near the lowest levels yet recorded at Tatlawiksuk River weir, except for one flood event in late August and September when water levels rose nearly continually from 20 August to 13 September.
- Daily water temperatures at Tatlawiksuk River weir in 2005 were above average for most of the season, and exceeded the historical maximum for about 2 weeks in late July and early August.
- Daily water temperatures calculated from data logger records were on average 1° C warmer than the average determined from twice-daily thermometer observations.

RELATED FISHERIES PROJECTS

- The Tatlawiksuk River weir served as an important platform for several projects conducted in the Kuskokwim River drainage in 2005, including *Inriver Abundance of Chinook Salmon in the Kuskokwim River* (FIS #05-302), *Kuskokwim River Sockeye Salmon Radiotelemetry Feasibility Study, A Mark–Recapture Experiment of Kuskokwim River Chinook, Sockeye, Chum, and Coho Salmon* (FIS #04-308), and *Genetic Diversity of Chinook Salmon from the Kuskokwim River* (FIS #01-070).

RECOMMENDATIONS

PROJECT OPERATION

- Annual operation of the Tatlawiksuk River weir should continue indefinitely. Although the weir malfunction caused the project to terminate prematurely in 2003, the weir was successfully improved and operated in 2004 and 2005. The Tatlawiksuk River weir project has been a valuable addition to the array of well-distributed escapement monitoring projects throughout the Kuskokwim River drainage. Adequate monitoring of Kuskokwim River salmon escapements is one of many requirements needed for long-term sustainable management of Kuskokwim River salmon stocks. Discontinuation of the Tatlawiksuk River weir, or any other escapement monitoring project, would be a step backward from progress made in recent years toward collecting salmon stock assessment and information needs in the Kuskokwim River drainage. Additionally, the Tatlawiksuk River weir project serves as one of several data collection platforms critical to other Kuskokwim River salmon research projects. *Inriver Abundance of Chinook Salmon in the Kuskokwim River* project (FIS #05-302) is critically dependent on data collected from these weirs to generate total river abundance estimates. *Kuskokwim River Salmon Mark–Recapture Project* (FIS #04-308) uses weir-recaptured spaghetti tagged Chinook, chum, sockeye, and coho salmon to develop and test total river abundance estimates, and these recaptures are critical for determining stock-specific run timing in the mainstem Kuskokwim River. Tatlawiksuk River is part of the genetic stock identification (GSI) baseline for Chinook, chum, and coho salmon, and plans are underway to use the weir for additional sample collection.

- Establish escapement goals for Tatlawiksuk River Chinook, chum, and coho salmon. ADF&G should continue seeking to establish biological escapement goals (BEG) to produce maximum sustainable yield (MSY) for these species at the Tatlawiksuk River, and in other Kuskokwim River spawning tributaries; however, determining MSY requires a rigorous level of stock specific spawner-recruit information still lacking. Alternatively, sustainable escapement goals (SEG) can be established, but require a 5 to 10 year data series of reliable escapement estimates that demonstrate sustainable yields. Recent deliberations on establishing escapement goals at the Tatlawiksuk River and other Kuskokwim River tributaries resulted in inaction because of inadequate historical escapement information (ADF&G 2004), heightening the need for uninterrupted continuation of the project.

PROJECT MANAGEMENT

- The Tatlawiksuk River weir should continue to be operated jointly by KNA and ADF&G. The partnership developed between KNA and ADF&G in the operation of fisheries projects, including the Tatlawiksuk River weir, has proven to be a successful strategy. Each organization compliments the partnership by providing an element the other cannot.

  KNA provides a communication link to help its constituents be more informed and less prone to the distrust and misinformation that can result when local organizations and their constituents are not directly involved. Active involvement of KNA adds an element of trust and acceptance toward the projects and ADF&G, which would not exist if ADF&G operated these projects alone. KNA is more effective at hiring technicians for these projects from the local area, and makes these jobs more acceptable and accessible for potential applicants. Additionally, the proximity of KNA facilities to these cooperatively managed projects provides logistical benefits for staging and for responding to various inseason project needs.

  Despite these attributes, KNA would have difficulty managing the Tatlawiksuk River weir and other jointly operated fisheries projects without ADF&G involvement. The fisheries staff of ADF&G has a greater depth of experience in fisheries project management; both in terms of on-site field experience, and broader aspects such as planning, data management and analysis, and report writing. The addition of a Partners Fisheries Biologist to the KNA staff has shifted some of these responsibilities to KNA, evident with the inclusion of a KNA biologist as a co-author of this report since 2003. However, the addition of one fisheries biologist to the KNA staff has not replaced all

ADF&G personnel involved and the many years of fisheries management experience, scientific expertise, and understanding they contribute. Additionally, KNA's fisheries biologist has a myriad of other responsibilities, and is involved with multiple projects and with multiple cooperative partners. This time limit reduces the direct attention KNA's biologist can contribute to individual project requirements.

Partnership between KNA and ADF&G is a major contributing factor to success of the many fisheries projects for which these organizations are responsible. Dissolution of this partnership would result in a detrimental loss of continuity and support to both inseason and postseason project requirements, and increase the possibility of misunderstanding and mistrust between ADF&G, KNA, and the public. Continued joint operation will help to ensure the success of these projects in the future.

AGE, SEX, AND LENGTH DATA

- Sample size objectives for ASL sampling of Chinook salmon should be re-evaluated and possibly changed to be more reflective of the actual run sizes encountered in the Tatlawiksuk River. Under current methods, the crew is expected to annually collect 630 Chinook salmon; i.e., 3 pulses each consisting of 210 fish. The total annual Chinook run in the Tatlawiksuk River, however, has only ranged from 817 to 2,918 fish. The current ASL sampling size objectives are designed for larger populations and may not be appropriate for the Tatlawiksuk River population.

WEATHER AND STREAM OBSERVATIONS

- Continue the use of a water temperature data logger in the river channel to enable the determination of high, low, and mean daily measurements. This would provide more complete temperature documentation and enable better comparisons between years.
- Conduct additional stream discharge surveys to reestablish a link between flows and a new, more permanent benchmark. Several stream discharge surveys were conducted in previous years at Tatlawiksuk River weir, but these were never linked to a viable permanent benchmark.

ACKNOWLEDGMENTS

Tatlawiksuk River salmon escapement monitor program is a cooperative project operated jointly by KNA and ADF&G Division of Commercial Fisheries. The USFWS Office of Subsistence Management (OSM) provided $87,145 in funding support to KNA and ADF&G for this project through the Fisheries Resource Monitoring Program under Cooperative agreement 701814J570 for project FIS 04-310. Since inception of the project in 1998, operational funds have been provided to KNA from a number of sources including grants from the National Fish and Wildlife Foundation (#1998-0241), and a grant from the U.S. Bureau of Indian Affairs that is administered by the Bering Sea Fishermen's Association (#E00441023). Additional funding for ADF&G's participation in this project was through a combination of state general funds and a grant from the Western Alaska Fishery Disaster Relief Program (NA 96FM0196) under the National Oceanic and Atmospheric Administration. USFWS OSM Resource Monitoring Program under Cooperative Agreement 701814J568 funded project FIS 04-307 which supported salmon age, sex, and length aging and data analysis for this project among others. In addition, other groups such as Kuskokwim Corporation and ADF&G Division of Sport Fish provided in-kind support to the project in the form of land-use authorization for the camp, and facilities for weir fabrication and welding services.

Many individuals contributed to the operation of the Tatlawiksuk River weir in 2005. Thanks to David Cannon, Dwayne Hoffman, Samantha John, Tamara Kvamme, David Orabutt, and Karrina Wooderson of KNA who assisted with administrative needs and logistical support. Many crew members contributed to the success of the Tatlawiksuk River weir during the 2005 field season, including Harry Allain Jr., Dana Diehl, Dwayne Hoffman, Caroline Kvamme, Michael Middlemist, Roger Morgan, and Duke Pensgard from KNA, Byron Dull from ONC, and Rob Stewart and Zack Tomco from ADF&G. Jim Jasper and Cullin Lester worked tirelessly to repair, install, and remove the weir before and after the season.

The authors would like to thank the numerous high school students who contributed to the project through the KNA student internship program. We would especially like to thank the Gregory family of Sinka's Landing for providing winter storage facilities and many hours of Alaskan hospitality.

REFERENCES CITED

ADF&G (Alaska Department of Fish and Game). 1998. An atlas to the catalog of water important for spawning, rearing or migration of anadromous fishes. Region VI: Interior region resource management. Alaska Department of Fish and Game, Habitat and Restoration Division, Anchorage.

ADF&G (Alaska Department of Fish and Game). 2003. Alaska Subsistence Fisheries, 2002 Annual Report. Alaska Department of Fish and Game, Division of Subsistence, Juneau.

ADF&G (Alaska Department of Fish and Game). 2004. Escapement goal review of select AYK Region salmon stocks. Alaska Department of Fish and Game, Division of Commercial Fisheries, Regional Informational Report 3A04-01, Anchorage.

Bergstrom, D. J. and C. Whitmore. 2004. Kuskokwim River Chinook and chum salmon stock status and action plan, a report to the Alaska Board of Fisheries. Alaska Department of Fish and Game, Division of Commercial Fisheries, Regional Informational Report 3A04-02, Anchorage.

Brannian, L. K., S. Darr, H. A. Krenz, S. StClair, and C. Lawn. 2005. Development of the Arctic-Yukon-Kuskokwim salmon database management system through June 30, 2005. Alaska Department of Fish and Game, Special Publication No. 05-10, Anchorage. http://www.sf.adfg.state.ak.us/FedAidPDFs/sp05-10.pdf

Bromaghin, J. F. 1993. Sample size determination for interval estimation of multinomial probabilities. The American Statistician. 47(3): 203-206.

Brown, C. M. 1983. Alaska's Kuskokwim River region: a history, draft. Bureau of Land Management, Anchorage.

Buklis, L. S. 1999. A description of economic changes in commercial salmon fisheries in a region of mixed subsistence and market economies. Arctic 52 (1): 40-48.

Burkey, C. Jr., and P. Salomone. 1999. Kuskokwim Area salmon escapement observation catalog, 1984-1998. Alaska Department of Fish and Game, Division of Commercial Fisheries, Regional Information Report No. 3A99-11, Anchorage.

Burkey, C. Jr., M. Coffing, D. B. Molyneaux and P. Salomone. 2000. Kuskokwim River chinook salmon stock status and development of management/action plan options, report to the Alaska Board of Fisheries. Alaska Department of Fish and Game, Division of Commercial Fisheries, Regional Information Report 3A00-40, Anchorage.

REFERENCES CITED (Continued)

Cederholm, C. J., M. D. Kunze, T. Murota and A. Sibatani. 1999. Pacific salmon carcasses: essential contributions of nutrients and energy for aquatic and terrestrial ecosystems. Fisheries 24(10): 6-15.

Cederholm, C. J., D. H. Johnson, R. E. Bilby, L. G. Dominguez, A. M. Garrett, W. H. Graeber, E. L. Greda, M. D. Kunze, B. G. Marcot, J. F. Palmisano, W. G. Pearcy, C. A. Simenstad, and P. C. Trotter. 2000. Pacific salmon and wildlife–ecological contexts, relationships, and implications for management. Special Edition Technical Report, Prepared for D.H. Johnson and T.A. O'Neil (Mang. Dirs.). Wildlife-Habitat Relationships in Oregon and Washington. Washington Department of Fish and Wildlife, Olympia.

Coffing, M. 1991. Kwethluk subsistence: contemporary land use patterns, wild resource harvest and use, and the subsistence economy of a lower Kuskokwim River area community. Alaska Department of Fish and Game, Division of Subsistence, Technical Paper No. 157, Juneau.

Coffing, M. *Unpublished* a. Kuskokwim area subsistence salmon harvest summary, 1996; prepared for the Alaska Board of Fisheries, Fairbanks, Alaska, December 2, 1997. Alaska Department of Fish and Game, Division of Subsistence, Bethel.

Coffing, M. *Unpublished* b. Kuskokwim area subsistence salmon fishery; prepared for the Alaska Board of Fisheries, Fairbanks, Alaska, December 2, 1997. Alaska Department of Fish and Game, Division of Subsistence, Bethel.

Coffing, M., L. Brown, G. Jennings and C. Utermohle. 2001. The subsistence harvest and use of wild resources in Akiachak, Alaska, 1998. Alaska Department of Fish and Game, Division of Subsistence, Final Project Report to U.S. Fish and Wildlife Service, Office of Subsistence Management, FIS 00-009, Juneau.

Costello, D. J., D. B. Molyneaux, and C. Goods. 2006. Takotna River salmon studies, 2005. Alaska Department of Fish and Game, Fishery Data Series No. 06-26, Anchorage. http://www.sf.adfg.state.ak.us/FedAidPDFs/fds06-26.pdf

DuBois, L. and D. B. Molyneaux. 2000. Salmon age, sex, and length catalog for the Kuskokwim Area, 1999 Progress Report. Alaska Department of Fish and Game, Division of Commercial Fisheries, Regional Information Report No. 3A00-18, Anchorage.

Gilk, S. E. *Unpublished*. Kuskokwim River sockeye salmon radiotelemetry feasibility study, 2005. Located at: Alaska Department of Fish and Game, 333 Raspberry Road, Anchorage, Alaska.

Estensen, J. L. 2002. Middle Fork Goodnews River fisheries studies, 2000 - 2001. Alaska Department of Fish and Game, Division of Commercial Fisheries, Regional Information Report No. 3A02-31, Anchorage.

Groot, C. and L. Margolis, *editors*. 1991. Pacific Salmon Life Histories. University of British Columbia Press, Vancouver, British Columbia.

Harper, K. C. and C. B. Watry. 2001. Abundance and run timing of adult salmon in the Kwethluk River, Yukon Delta National Wildlife Refuge, Alaska, 2000. U.S. Fish and Wildlife Service, Kenai Fishery Resource Office, Alaska Fishery Data Series Number 2001-4, Kenai, Alaska.

Hauer, F. R. and W. R. Hill. 1996. Temperature, light and oxygen. Pages 93-106 in F. R. Hauer and G. A. Lambert (editors) Methods in Stream Ecology. Academic Press, San Diego.

Holmes, R. A. and R. D. Burtkett. 1996. Salmon stewardship: Alaska's perspective. Fisheries 21 (10): 36-38.

INPFC (International North Pacific Fisheries Commission). 1963. Annual report, 1961. International North Pacific Fisheries Commission, Vancouver, British Columbia.

Jasper, J. R., and D. B. Molyneaux. *In prep*. Kogrukluk River salmon studies, 2005. Alaska Department of Fish and Game, Division of Commercial Fisheries, Fishery Data Series, Anchorage.

Keefer, M. L., C. A. Peery, M. A. Jepson, K. R. Tolotti, and T. C. Bjornn. 2004. Stock-specific migration timing of adult spring-summer Chinook salmon in the Columbia River basin. North American Journal of Fisheries Management 24:1145-1162.

REFERENCES CITED (Continued)

Kerkvliet, C. M., T. Hamazaki, K. E. Hyer, and D. Cannon. 2003. A mark–recapture experiment to estimate the abundance of Kuskokwim River chum, sockeye, and coho salmon, 2002. Alaska Department of Fish and Game, Division of Commercial Fisheries, Regional Information Report No. 3A03-25, Anchorage.

Kruse, G. H. 1998. Salmon run failures in 1997-1998: a link to anomalous ocean conditions? Alaska Fishery Research Bulletin 5 (1): 55-63.

Linderman, J. C. Jr., D. B. Molyneaux, L. DuBois and W. Morgan. 2002. Tatlawiksuk River weir salmon studies, 1998–2001. Alaska Department of Fish and Game, Division of Commercial Fisheries, Regional Information Report No. 3A02-11, Anchorage.

Linderman, J. C. Jr., D. J. Cannon, and D. B. Molyneaux. 2003. Tatlawiksuk River weir salmon studies, 2002. Alaska Department of Fish and Game, Division of Commercial Fisheries, Regional Information Report No. 3A03-16, Anchorage.

Linderman, J. C., M. M. Martz, and D. G. Bue. *In prep*. Annual management report for the subsistence and commercial fisheries of the Kuskokwim Area, 2005. Alaska Department of Fish and Game, Fisheries Management Report, Anchorage.

McEwen, M. S. *In prep*. Sonar estimation of chum salmon passage in the Aniak River, 2005. Alaska Department of Fish and Game, Fishery Data Series, Anchorage.

Molyneaux, D. B. and D. Folletti. 2005. Salmon age, sex, and length catalog for the Kuskokwim Area, 2004. Alaska Department of Fish and Game, Division of Commercial Fisheries, Regional Information Report No. 3A05-03, Anchorage.

Molyneaux, D. B., C. A. Shelden, and D. Folletti. *In prep*. Salmon age, sex, and length catalog for the Kuskokwim Area, 2005. Alaska Department of Fish and Game, Division of Commercial Fisheries, Regional Information Report, Anchorage.

Mundy, P. R. 1998. Principles and criteria for sustainable salmon management, a contribution to the development of a salmon fishery evaluation framework for the State of Alaska. Alaska Department of Fish and Game, Contract No. IHP-98-045, Anchorage.

NRC (National Research Council). 1996. Upstream: salmon and society in the Pacific Northwest, Committee on the Protection and Management of Pacific Northwest Salmonids. National Academy Press, Washington, D.C.

Pawluk, J., T. Hamazaki, K. E. Hyer, and D. Cannon. *In prep* a. Kuskokwim River sockeye, chum, and coho salmon tagging study, 2004. Alaska Department of Fish and Game, Fishery Data Series, Anchorage.

Pawluk, J., T. Hamazaki, K. E. Hyer, and D. Cannon. *In prep* b. Kuskokwim River Chinook, sockeye, chum, and coho salmon tagging study, 2005. Alaska Department of Fish and Game, Fishery Data Series, Anchorage.

Quinn, T. P. 2005. The behavior and ecology of Pacific salmon and trout. University of Washington Press, Seattle.

Roettiger, T., F. G. Harris, and K. C. Harper. 2005. Abundance and run timing of adult Pacific salmon in the Kwethluk River, Yukon Delta National Wildlife Refuge, Alaska, 2004. U.S. Fish and Wildlife Service, Kenai Fish and Wildlife Field Office. Alaska Fisheries Data Series No. 2005-7, Kenai, Alaska.

Schneiderhan, D. J. *Unpublished*. Kuskokwim stream catalog, 1954-1983. Alaska Department of Fish and Game, Division of Commercial Fisheries, Anchorage.

Schwanke, C. J., D. B. Molyneaux, L. DuBois, and C. Goods. 2001. Takotna River salmon studies and upper Kuskokwim River aerial surveys, 2000. Alaska Department of Fish and Game, Division of Commercial Fisheries, Regional Information Report No. 3A01-02, Anchorage.

Schwanke, C. J., and D. B. Molyneaux. 2002. Takotna River salmon studies and upper Kuskokwim River aerial surveys, 2001. Alaska Department of Fish and Game, Division of Commercial Fisheries, Regional Information Report 3A02-09, Anchorage.

Stewart, R. 2002. Resistance board weir panel construction manual, 2002. Alaska Department of Fish and Game, Division of Commercial Fisheries, Regional Information Report No. 3A02-21, Anchorage.

Stewart, R. 2003. Techniques for installing a resistance board fish weir. Alaska Department of Fish and Game, Division of Commercial Fisheries, Regional Information Report No. 3A03-26, Anchorage.

Stewart, R., and D. B. Molyneaux. 2005. Tatlawiksuk River salmon studies, 2004. Alaska Department of Fish and Game, Fishery Data Series No. 05-47, Anchorage. http://www.sf.adfg.state.ak.us/FedAidPDFs/fds05-47.pdf

Stewart, R., D. B. Molyneaux, D. J. Costello, and D. E. Orabutt. *In prep*. George River salmon studies, 2005. Alaska Department of Fish and Game, Fishery Data Series, Anchorage.

Stroka, S. M. and A. L. J. Brase. 2004. Assessment of Chinook, chum, and coho salmon escapements in the Holitna River drainage using radiotelemetry, 2001–2003. Final Report for Study 01-141 USFWS Office of Subsistence Management Fisheries Information Services Division. Alaska Department of Fish and Game, Fishery Data Series No. 04-07, Anchorage. http://www.sf.adfg.state.ak.us/FedAidPDFs/fds04-07.pdf

Stuby, L. 2003. Inriver abundance of chinook salmon in the Kuskokwim River, 2002. Annual Report for Study 02-015, USFWS Office of Subsistence Management, Fishery Information Service Division. Alaska Department of Fish and Game, Fishery Data Series No. 03-22, Anchorage. http://www.sf.adfg.state.ak.us/FedAidPDFs/fds03-22.pdf

Stuby, L. 2004. Inriver abundance of Chinook salmon in the Kuskokwim River, 2003. Alaska Department of Fish and Game, Fishery Data Series No. 04-30, Anchorage. http://www.sf.adfg.state.ak.us/FedAidPDFs/fds04-30.pdf

Stuby, L. 2005. Inriver abundance of Chinook salmon in the Kuskokwim River, 2004. Alaska Department of Fish and Game, Fishery Data Series No. 05-39, Anchorage. http://www.sf.adfg.state.ak.us/FedAidPDFs/fds05-39.pdf

Stuby, L. *In prep*. Inriver abundance of Chinook salmon in the Kuskokwim River, 2005. Alaska Department of Fish and Game, Fishery Data Series, Anchorage.

Templin, W. D., C.T. Smith, D.B. Molyneaux, and L.W. Seeb. *In prep*. Genetic stock identification of Kuskokwim River Chinook salmon. Alaska Department of Fish and Game, Division of Commercial Fisheries, Regional Information Report, Anchorage.

Thompson, S. K. 1992. Sampling. John Wiley and Sons, New York.

Tobin, J. H. 1994. Construction and performance of a portable resistance board weir for counting migrating adult salmon in rivers. U.S. Fish and Wildlife Service, Kenai Fishery Resource Office, Alaska Fisheries Technical Report Number 22, Kenai, Alaska.

Ward, T. C., M. Coffing, J. L. Estensen, R. L. Fisher, and D. B. Molyneaux. 2003. Annual management report for the subsistence and commercial fisheries of the Kuskokwim Area, 2002. Alaska Department of Fish and Game, Division of Commercial Fisheries, Regional Information Report No. 3A03-27, Anchorage.

Whitmore, C., M. M. Martz, D. G. Bue, J. C. Linderman, and R. L. Fisher. 2005. Annual management report for the subsistence and commercial fisheries of the Kuskokwim Area, 2003. Alaska Department of Fish and Game, Fishery Management Report No. 05-72, Anchorage. http://www.sf.adfg.state.ak.us/FedAidPDFs/fmr05-72.pdf

Whitmore, C., M. Martz, D. G. Bue and J. C. Linderman. *In prep*. Annual management report for the subsistence and commercial fisheries of the Kuskokwim Area, 2004. Alaska Department of Fish and Game, Fisheries Management Report, Anchorage.

Zabkar, L. M., F. G. Harris, and K. C. Harper. *In prep*. Abundance and run timing of adult Pacific salmon in the Tuluksak River, Yukon Delta National Wildlife Refuge, Alaska, 2005. U.S. Fish and Wildlife Service, Kenai Fish and Wildlife Field Office. Alaska Fisheries Data Series, Kenai, Alaska.

TABLES AND FIGURES

Table 1.–Daily cumulative, and daily cumulative percent passage for Chinook, chum, coho, and sockeye salmon and longnose suckers at Tatlawiksuk River weir, 2005.

	Chinook Salmon			Chum Salmon			Coho Salmon			Sockeye Salmon			Longnose Sucker		
Date	Daily	Cum.	Percent Passage	Daily	Cum.	Percent Passage	Daily	Cum.	Percent Passage	Daily	Cum.	Percent Passage	Daily	Cum.	Percent Passage
12-Jun [a]	1			0			0			0			230		
13-Jun [a]	1			0			0			0			150		
14-Jun [a]	0			0			0			0			196		
15-Jun	0	0	0	0	0	0	0	0	0	0	0	0	153	153	11
16-Jun	0	0	0	3	3	0	0	0	0	0	0	0	384	537	40
17-Jun	0	0	0	0	3	0	0	0	0	0	0	0	219	756	56
18-Jun	1	1	0	2	5	0	0	0	0	0	0	0	37	793	58
19-Jun	1	2	0	10	15	0	0	0	0	0	0	0	57	850	63
20-Jun	1	3	0	4	19	0	0	0	0	0	0	0	25	875	64
21-Jun	6	9	0	9	28	0	0	0	0	0	0	0	20	895	66
22-Jun	7	16	1	13	41	0	0	0	0	0	0	0	50	945	70
23-Jun	3	19	1	7	48	0	0	0	0	0	0	0	30	975	72
24-Jun	6	25	1	32	80	0	0	0	0	0	0	0	120	1,095	81
25-Jun	5	30	1	15	95	0	0	0	0	0	0	0	25	1,120	82
26-Jun	27	57	2	36	131	0	0	0	0	0	0	0	53	1,173	86
27-Jun	10	67	2	43	174	0	0	0	0	0	0	0	19	1,192	88
28-Jun	5	72	2	56	230	0	0	0	0	0	0	0	9	1,201	88
29-Jun	5	77	3	130	360	1	0	0	0	0	0	0	16	1,217	90
30-Jun	192	269	9	366	726	1	0	0	0	0	0	0	4	1,221	90
1-Jul	24	293	10	213	939	2	0	0	0	0	0	0	5	1,226	90
2-Jul	74	367	13	1,605	2,544	5	0	0	0	0	0	0	2	1,228	90
3-Jul	481	848	29	2,380	4,924	9	0	0	0	0	0	0	1	1,229	90
4-Jul	248	1,096	38	1,110	6,034	11	0	0	0	0	0	0	2	1,231	91
5-Jul	239 [b]	1,335	46	1,387 [b]	7,421	13	0 [b]	0	0	0 [b]	0	0	20 [b]	1,251	92
6-Jul	87	1,422	49	993	8,414	15	0	0	0	0	0	0	48	1,299	96
7-Jul	140	1,562	54	1,063	9,477	17	0	0	0	0	0	0	30	1,329	98
8-Jul	98	1,660	57	1,439	10,916	20	0	0	0	0	0	0	16	1,345	99
9-Jul	112	1,772	61	1,748	12,664	23	0	0	0	0	0	0	1	1,346	99
10-Jul	95	1,867	64	1,546	14,210	26	0	0	0	0	0	0	3	1,349	99
11-Jul	143	2,010	69	2,741	16,951	30	0	0	0	0	0	0	0	1,349	99
12-Jul	101	2,111	72	2,775	19,726	35	0	0	0	0	0	0	1	1,350	99
13-Jul	86	2,197	75	2,610	22,336	40	0	0	0	1	1	1	0	1,350	99
14-Jul	123	2,320	80	3,095	25,431	46	0	0	0	1	2	3	0	1,350	99
15-Jul	35	2,355	81	2,780	28,211	51	0	0	0	0	2	3	2	1,352	99
16-Jul	96	2,451	84	3,283	31,494	57	0	0	0	3	5	7	1	1,353	100
17-Jul	70	2,521	86	2,370	33,864	61	0	0	0	2	7	9	0	1,353	100

-continued-

Table 1.–Page 2 of 3.

	Chinook Salmon			Chum Salmon			Coho Salmon			Sockeye Salmon			Longnose Sucker		
Date	Daily	Cum.	Percent Passage	Daily	Cum.	Percent Passage	Daily	Cum.	Percent Passage	Daily	Cum.	Percent Passage	Daily	Cum.	Percent Passage
18-Jul	65	2,586	89	2,260	36,124	65	1	1	0	1	8	10	0	1,353	100
19-Jul	80	2,666	91	2,115	38,239	69	0	1	0	2	10	13	0	1,353	100
20-Jul	52	2,718	93	2,156	40,395	72	0	1	0	4	14	18	0	1,353	100
21-Jul	36	2,754	94	2,196	42,591	76	0	1	0	1	15	20	0	1,353	100
22-Jul	24	2,778	95	1,422	44,013	79	2	3	0	2	17	22	0	1,353	100
23-Jul	10	2,788	96	1,491	45,504	82	1	4	0	2	19	25	0	1,353	100
24-Jul	15	2,803	96	1,152	46,656	84	6	10	0	3	22	29	1	1,354	100
25-Jul	11	2,814	96	1,138	47,794	86	8	18	0	2	24	31	2	1,356	100
26-Jul	11	2,825	97	1,144	48,938	88	16	34	0	4	28	36	0	1,356	100
27-Jul	5	2,830	97	794	49,732	89	21	55	1	2	30	39	0	1,356	100
28-Jul	12	2,842	97	807	50,539	91	16	71	1	3	33	43	0	1,356	100
29-Jul	14	2,856	98	732	51,271	92	19	90	1	1	34	44	0	1,356	100
30-Jul	12	2,868	98	680	51,951	93	37	127	2	4	38	50	1	1,357	100
31-Jul	8	2,876	99	587	52,538	94	38	165	2	0	38	50	0	1,357	100
1-Aug	3	2,879	99	344	52,882	95	20	185	2	2	40	52	1	1,358	100
2-Aug	7	2,886	99	440	53,322	96	29	214	3	2	42	55	0	1,358	100
3-Aug	5	2,891	99	486	53,808	97	70	284	4	2	44	57	0	1,358	100
4-Aug	0	2,891	99	266	54,074	97	36	320	4	2	46	60	0	1,358	100
5-Aug	7	2,898	99	265	54,339	98	36	356	5	0	46	60	0	1,358	100
6-Aug	2	2,900	99	227	54,566	98	51	407	5	8	54	70	0	1,358	100
7-Aug	3	[b] 2,903	99	196	[b] 54,761	98	80	[b] 487	6	4	[b] 58	75	0	[b] 1,358	100
8-Aug	2	2,905	100	122	54,883	98	60	547	7	2	60	78	0	1,358	100
9-Aug	0	2,905	100	168	55,051	99	172	719	10	5	65	84	0	1,358	100
10-Aug	0	2,905	100	105	55,156	99	118	837	11	4	69	90	0	1,358	100
11-Aug	0	2,905	100	62	55,218	99	101	938	13	2	71	92	0	1,358	100
12-Aug	0	2,905	100	93	55,311	99	91	1,029	14	0	71	92	0	1,358	100
13-Aug	1	2,906	100	63	55,374	99	73	1,102	15	0	71	92	0	1,358	100
14-Aug	1	2,907	100	59	55,433	99	167	1,269	17	0	71	92	0	1,358	100
15-Aug	2	2,909	100	55	55,488	100	82	1,351	18	1	72	93	0	1,358	100
16-Aug	1	2,910	100	44	55,532	100	71	1,422	19	0	72	93	0	1,358	100
17-Aug	0	2,910	100	16	55,548	100	277	1,699	23	1	73	95	0	1,358	100
18-Aug	1	2,911	100	28	55,576	100	162	1,861	25	0	73	95	0	1,358	100
19-Aug	0	2,911	100	19	55,595	100	125	1,986	26	0	73	95	0	1,358	100
20-Aug	1	2,912	100	6	55,601	100	118	2,104	28	0	73	95	0	1,358	100
21-Aug	0	2,912	100	12	55,613	100	111	2,215	30	0	73	95	0	1,358	100

-continued-

Table 1.–Page 3 of 3.

Date	Chinook Salmon Daily	Chinook Salmon Cum.	Chinook Salmon Percent Passage	Chum Salmon Daily	Chum Salmon Cum.	Chum Salmon Percent Passage	Coho Salmon Daily	Coho Salmon Cum.	Coho Salmon Percent Passage	Sockeye Salmon Daily	Sockeye Salmon Cum.	Sockeye Salmon Percent Passage	Longnose Sucker Daily	Longnose Sucker Cum.	Longnose Sucker Percent Passage
22-Aug	2	2,914	100	33	55,646	100	80	2,295	31	0	73	95	0	1,358	100
23-Aug	0	2,914	100	17	55,663	100	757	3,052	41	0	73	95	0	1,358	100
24-Aug	1	2,915	100	13	55,676	100	881	3,933	52	0	73	95	0	1,358	100
25-Aug	1	2,916	100	1	55,677	100	277	4,210	56	0	73	95	0	1,358	100
26-Aug	1	2,917	100	5	55,682	100	199	4,409	59	0	73	95	0	1,358	100
27-Aug	1	2,918	100	5	55,687	100	194	4,603	61	1	74	96	0	1,358	100
28-Aug	0	2,918	100	5	55,692	100	177	4,780	64	1	75	97	0	1,358	100
29-Aug	0	2,918	100	4	55,696	100	226	5,006	67	0	75	97	1	1,359	100
30-Aug	0	2,918	100	3	55,699	100	162	5,168	69	1	76	99	0	1,359	100
31-Aug	0	2,918	100	2	55,701	100	211	5,379	72	0	76	99	0	1,359	100
1-Sep	0	2,918	100	0	55,701	100	72	5,451	73	1	77	100	0	1,359	100
2-Sep	0	2,918	100	1	55,702	100	92	5,543	74	0	77	100	0	1,359	100
3-Sep	0	2,918	100	1	55,703	100	52	5,595	75	0	77	100	0	1,359	100
4-Sep	0	2,918	100	2	55,705	100	323	5,918	79	0	77	100	0	1,359	100
5-Sep	0	2,918	100	3	55,708	100	264	6,182	82	0	77	100	0	1,359	100
6-Sep	0	2,918	100	1	55,709	100	164	6,346	85	0	77	100	0	1,359	100
7-Sep	0	2,918	100	1	55,710	100	108	6,454	86	0	77	100	0	1,359	100
8-Sep	0	2,918	100	2	55,712	100	159	6,613	88	0	77	100	0	1,359	100
9-Sep	0	2,918	100	0	55,712	100	92	6,705	89	0	77	100	0	1,359	100
10-Sep	0	[c] 2,918	100	1	[c] 55,713	100	117	[c] 6,821	91	0	[c] 77	100	0	[c] 1,359	100
11-Sep	0	[c] 2,918	100	1	[c] 55,714	100	108	[c] 6,929	92	0	[c] 77	100	0	[c] 1,359	100
12-Sep	0	[c] 2,918	100	1	[c] 55,715	100	99	[c] 7,029	94	0	[c] 77	100	0	[c] 1,359	100
13-Sep	0	[c] 2,918	100	1	[c] 55,716	100	90	[c] 7,119	95	0	[c] 77	100	0	[c] 1,359	100
14-Sep	0	[c] 2,918	100	1	[c] 55,716	100	82	[c] 7,201	96	0	[c] 77	100	0	[c] 1,359	100
15-Sep	0	[c] 2,918	100	1	[c] 55,717	100	73	[c] 7,274	97	0	[c] 77	100	0	[c] 1,359	100
16-Sep	0	[c] 2,918	100	1	[c] 55,718	100	64	[c] 7,338	98	0	[c] 77	100	0	[c] 1,359	100
17-Sep	0	[c] 2,918	100	1	[c] 55,718	100	55	[c] 7,393	99	0	[c] 77	100	0	[c] 1,359	100
18-Sep	0	[c] 2,918	100	1	[c] 55,719	100	47	[c] 7,439	99	0	[c] 77	100	0	[c] 1,359	100
19-Sep	0	[c] 2,918	100	1	[c] 55,720	100	38	[c] 7,477	100	0	[c] 77	100	0	[c] 1,359	100
20-Sep	0	2,918	100	0	55,720	100	18	7,495	100	0	77	100	0	1,359	100
21-Sep [a]	0			0			40			0			0		
22-Sep [a]	0			0			24			0			0		

Note: The boxes represent the median passage date and central 50% of the run. Cum.= cumulative.

[a] Date outside of target operational period; daily passage not included in cumulative escapement.

[b] Estimated salmon passage (partial day).

[c] Estimated salmon passage (whole day).

Table 2.–Age and sex composition of Chinook salmon at the Tatlawiksuk River weir in 2005, based on escapement samples collected with a live trap.

				Age Class															
	Sample Dates	Sample		1.1		1.2		1.3		2.2		1.4		1.5		2.4		Total	
Year	(Stratum Dates)	Size	Sex	Esc.	%	Esc.	%	Esc.	%	Esc.	%	Esc.	%	Esc.	%	Esc.	%	Esc.	%
2005	6/29- 7/6	111	M	0	0.0	253	16.2	549	35.2	0	0.0	197	12.6	0	0.0	0	0.0	999	64.0
	(6/15- 7/7)		F	0	0.0	0	0.0	239	15.3	0	0.0	310	19.8	14	0.9	0	0.0	563	36.0
			Subtotal[a]	0	0.0	253	16.2	788	50.5	0	0.0	507	32.4	14	0.9	0	0.0	1,562	100.0
	7/8- 13	115	M	0	0.0	79	10.4	211	27.8	0	0.0	86	11.3	0	0.0	0	0.0	376	49.6
	(7/8- 14)		F	0	0.0	0	0.0	184	24.4	0	0.0	191	25.2	7	0.9	0	0.0	382	50.4
			Subtotal[a]	0	0.0	79	10.4	395	52.2	0	0.0	277	36.5	7	0.9	0	0.0	758	100.0
	7/15- 24	74	M	0	0.0	52	10.8	124	25.7	0	0.0	72	14.9	13	2.7	0	0.0	261	54.1
	(7/15- 24)		F	0	0.0	0	0.0	98	20.2	0	0.0	117	24.3	7	1.4	0	0.0	222	45.9
			Subtotal[a]	0	0.0	52	10.8	222	45.9	0	0.0	189	39.2	20	4.1	0	0.0	483	100.0
	7/25- 8/18	84	M	0	0.0	7	6.0	19	16.7	0	0.0	14	11.9	0	0.0	0	0.0	40	34.5
	(7/25- 9/20)		F	0	0.0	0	0.0	21	17.8	0	0.0	53	46.4	1	1.2	0	0.0	75	65.5
			Subtotal[a]	0	0.0	7	6.0	40	34.5	0	0.0	67	58.3	1	1.2	0	0.0	115	100.0
	Season[b]	384	M	0	0.0	391	13.4	903	30.9	0	0.0	368	12.6	13	0.4	0	0.0	1,676	57.4
			F	0	0.0	0	0.0	542	18.6	0	0.0	672	23.0	29	1.0	0	0.0	1,242	42.6
			Total	0	0.0	391	13.4	1,445	49.5	0	0.0	1,040	35.6	42	1.4	0	0.0	2,918	100.0

[a] The number of fish in each stratum age and sex category are derived from the sample percentages; discrepancies in sums are attributed to rounding errors.

[b] The number of fish in "Season" summaries are the strata sums; "Season" percentages are derived from the sums of the estimated escapement that occurred in that stratum.

Table 3.–Mean length (mm) of Chinook salmon sampled at the Tatlawiksuk River weir in 2005, based on escapement samples collected with a live trap.

Year	Sample Dates Stratum Dates	Sex		Age Class 1.1	1.2	1.3	2.2	1.4	1.5	2.4
2005	6/29- 7/6	M	Mean Length		569	696		809		
	(6/15- 7/7)		SE		11	8		25		
			Range		460- 640	584- 840		687- 1010		
			Sample Size	0	18	39	0	14	0	0
		F	Mean Length			719		776	725	
			SE			11		15	-	
			Range			630- 825		660- 951	725- 725	
			Sample Size	0	0	17	0	22	1	0
	7/8- 13	M	Mean Length		575	693		773		
	(7/8- 14)		SE		12	8		27		
			Range		535- 645	628- 825		641- 920		
			Sample Size	0	12	32	0	13	0	0
		F	Mean Length			720		779	895	
			SE			8		12	-	
			Range			650- 795		651- 881	895- 895	
			Sample Size	0	0	28	0	29	1	0
	7/15- 24	M	Mean Length		577	710		857	827	
	(7/15- 24)		SE		6	10		50	114	
			Range		551- 600	630- 790		686- 1250	713- 940	
			Sample Size	0	8	19	0	11	2	0
		F	Mean Length			720		815	880	
			SE			12		16	-	
			Range			653- 805		640- 905	880- 880	
			Sample Size	0	0	15	0	18	1	0

-continued-

Table 3.–Page 2 of 2.

Year	Sample Dates Stratum Dates	Sex		Age Class 1.1	1.2	1.3	2.2	1.4	1.5	2.4
2005	7/25- 8/18	M	Mean Length		600	689		854		
	(7/25- 9/20)		SE		25	12		35		
			Range		534- 689	630- 765		698- 1011		
			Sample Size	0	5	14	0	10	0	0
		F	Mean Length			717		811	1055	
			SE			19		11	-	
			Range			600- 870		666- 940	1055- 1055	
			Sample Size	0	0	15	0	39	1	0
	Season[a]	M	Mean Length		572	697		812	827	
			Range		460- 689	584- 840		641- 1250	713- 940	
			Sample Size	0	43	104	0	48	2	0
		F	Mean Length			719		786	815	
			Range			600- 870		640- 951	725- 1055	
			Sample Size	0	0	75	0	108	4	0

Note: The sum of the sample sizes in each stratum equal the total sample size reported for that stratum in Table 2.

[a] "Season" mean lengths are weighted by the escapement passage in each stratum.

Table 4.–Age and sex composition of chum salmon at the Tatlawiksuk River weir in 2005, based on escapement samples collected with a live trap.

Year	Sample Dates (Stratum Dates)	Sample Size	Sex	0.2 Esc.	0.2 %	0.3 Esc.	0.3 %	0.4 Esc.	0.4 %	0.5 Esc.	0.5 %	Total Esc.	Total %
2005	6/28- 29, 7/1- 3	198	M	0	0.0	4,249	50.5	1,020	12.1	0	0.0	5,269	62.6
	(6/15- 7/6)		F	0	0.0	2,975	35.4	170	2.0	0	0.0	3,145	37.4
			Subtotal[a]	0	0.0	7,224	85.9	1,190	14.1	0	0.0	8,414	100.0
	7/11- 13	175	M	97	0.6	6,904	40.6	486	2.9	0	0.0	7,487	44.0
	(7/7- 14)		F	681	4.0	8,654	50.8	195	1.1	0	0.0	9,530	56.0
			Subtotal[a]	778	4.6	15,558	91.4	681	4.0	0	0.0	17,017	100.0
	7/18- 20	165	M	0	0.0	5,518	29.7	789	4.3	0	0.0	6,307	33.9
	(7/15-22)		F	1,126	6.1	10,924	58.8	225	1.2	0	0.0	12,275	66.1
			Subtotal[a]	1,126	6.1	16,442	88.5	1,014	5.5	0	0.0	18,582	100.0
	7/25- 27	185	M	0	0.0	2,668	36.7	39	0.5	0	0.0	2,707	37.3
	(7/23- 29)		F	628	8.6	3,845	53.0	79	1.1	0	0.0	4,551	62.7
			Subtotal[a]	628	8.6	6,513	89.7	118	1.6	0	0.0	7,258	100.0
	8/1- 3	188	M	49	1.6	1,012	33.0	0	0.0	0	0.0	1,061	34.6
	(7/30- 8/5)		F	245	8.0	1,762	57.4	0	0.0	0	0.0	2,007	65.4
			Subtotal[a]	294	9.6	2,774	90.4	0	0.0	0	0.0	3,068	100.0
	8/8- 10	111	M	9	0.9	403	41.4	18	1.8	0	0.0	430	44.1
	(8/6- 12)		F	35	3.6	509	52.3	0	0.0	0	0.0	543	55.9
			Subtotal[a]	44	4.5	912	93.7	18	1.8	0	0.0	973	100.0
	8/15- 18	53	M	0	0.0	101	24.6	0	0.0	0	0.0	101	24.5
	(8/13- 9/20)		F	23	5.7	278	67.9	8	1.9	0	0.0	309	75.5
			Subtotal[a]	23	5.7	379	92.5	8	1.9	0	0.0	410	100.0
	Season[b]	1,075	M	155	0.3	20,855	37.4	2,351	4.2	0	0.0	23,361	41.9
			F	2,738	4.9	28,947	52.0	676	1.2	0	0.0	32,361	58.1
			Total	2,893	5.2	49,802	89.4	3,027	5.4	0	0.0	55,722	100.0

[a] The number of fish in each stratum age and sex category are derived from the sample percentages; discrepancies in sums are attributed to rounding errors.

[b] The number of fish in "Season" summaries are the strata sums; "Season" percentages are derived from the sums of the estimated escapement that occurred in that stratum.

Table 5.–Mean length (mm) of chum salmon at the Tatlawiksuk River weir in 2005, based on escapement samples collected with a live trap.

Year	Sample Dates (Stratum Dates)	Sex		Age Class 0.2	0.3	0.4	0.5
2005	6/28-29, 7/1-3	M	Mean Length		589	614	
	(6/15-7/6)		SE		3	7	
			Range		495-675	533-680	
			Sample Size	0	100	24	0
		F	Mean Length		563	567	
			SE		4	15	
			Range		500-635	540-596	
			Sample Size	0	70	4	0
	7/11-13	M	Mean Length	535	569	596	
	(7/7-14)		SE	-	3	12	
			Range	535-535	498-640	550-624	
			Sample Size	1	71	5	0
		F	Mean Length	519	550	582	
			SE	7	3	19	
			Range	482-535	479-600	563-600	
			Sample Size	7	89	2	0
	7/18-20	M	Mean Length		570	607	
	(7/15-22)		SE		5	13	
			Range		503-660	547-662	
			Sample Size	0	49	7	0
		F	Mean Length	536	550	581	
			SE	7	3	11	
			Range	509-570	394-610	570-592	
			Sample Size	10	97	2	0
	7/25-27	M	Mean Length		562	627	
	(7/23-29)		SE		4	-	
			Range		484-650	627-627	
			Sample Size	0	68	1	0
		F	Mean Length	508	531	594	
			SE	4	3	39	
			Range	478-534	458-600	555-632	
			Sample Size	16	98	2	0
	8/1-3	M	Mean Length	509	551		
	(7/30-8/5)		SE	12	5		
			Range	489-531	407-617		
			Sample Size	3	62	0	0
		F	Mean Length	501	518		
			SE	6	3		
			Range	466-540	455-591		
			Sample Size	15	108	0	0

-continued-

Table 5.–Page 2 of 2.

Year	Sample Dates (Stratum Dates)	Sex		Age Class 0.2	0.3	0.4	0.5
	8/8-10	M	Mean Length	531	554	584	
	(8/6-12)		SE	-	4	19	
			Range	531-531	481-625	565-602	
			Sample Size	1	46	2	0
		F	Mean Length	478	517		
			SE	19	4		
			Range	446-533	445-577		
			Sample Size	4	58	0	0
	8/15-18	M	Mean Length		575		
	(8/13-9/20)		SE		10		
			Range		535-656		
			Sample Size	0	13	0	0
		F	Mean Length	498	525	589	
			SE	6	4	-	
			Range	490-511	480-586	589-589	
			Sample Size	3	36	1	0
	Season[a]	M	Mean Length	527	571	608	
			Range	489-535	407-675	533-680	
			Sample Size	5	409	39	0
		F	Mean Length	521	546	579	
			Range	446-570	394-635	540-632	
			Sample Size	55	556	11	0

Note: The sum of the sample sizes in each stratum equal the total sample size reported for that stratum in Table 4.

[a] "Season" mean lengths are weighted by the escapement passage in each stratum.

Table 6.–Age and sex composition of coho salmon at the Tatlawiksuk River weir in 2005, based on escapement samples collected with a live trap.

				Age Class							
				1.1		2.1		3.1		Total	
Year	Sample Dates (Stratum Dates)	Sample Size	Sex	Esc.	%	Esc.	%	Esc.	%	Esc.	%
2005	8/8- 18	193	M	95	3.1	1,487	48.7	47	1.6	1,629	53.4
	(6/15- 8/23)		F	63	2.1	1,265	41.5	95	3.1	1,423	46.4
			Subtotal[a]	158	5.2	2,752	90.2	142	4.7	3,052	100.0
	8/24- 27	138	M	61	2.9	1,165	55.1	16	0.7	1,242	58.7
	(8/24- 30)		F	46	2.2	675	31.9	153	7.3	874	41.3
			Subtotal[a]	107	5.1	1,840	87.0	169	8.0	2,116	100.0
	9/2- 5	145	M	48	2.1	931	40.0	32	1.4	1,011	43.4
	(8/31- 9/20)		F	16	0.7	1,204	51.7	96	4.1	1,317	56.6
			Subtotal[a]	64	2.8	2,135	91.7	128	5.5	2,328	100.0
	Season[b]	476	M	205	2.7	3,583	47.8	95	1.3	3,882	51.8
			F	125	1.7	3,144	41.9	344	4.6	3,614	48.2
			Total	330	4.4	6,727	89.7	439	5.9	7,496	100.0

[a] The number of fish in each stratum age and sex category are derived from the sample percentages; discrepancies in sums are attributed to rounding errors.

[b] The number of fish in "Season" summaries are the strata sums; "Season" percentages are derived from the sums of the estimated escapement that occurred in that stratum.

Table 7.–Mean length (mm) of coho salmon at the Tatlawiksuk River weir in 2005, based on escapement samples collected with a live trap.

Year	Sample Dates (Stratum Dates)	Sex		Age Class 1.1	2.1	3.1
2005	8/8- 18	M	Mean Length	516	557	531
	(6/15- 8/23)		SE	15	4	13
			Range	474- 569	427- 633	508- 552
			Sample Size	6	94	3
		F	Mean Length	555	554	558
			SE	8	4	24
			Range	543- 580	435- 620	451- 621
			Sample Size	4	80	6
	8/24- 27	M	Mean Length	541	551	585
	(8/24- 30)		SE	21	6	-
			Range	479- 569	385- 633	585- 585
			Sample Size	4	76	1
		F	Mean Length	556	552	551
			SE	7	6	17
			Range	546- 570	444- 618	415- 610
			Sample Size	3	44	10
	9/2- 5	M	Mean Length	562	558	571
	(8/31- 9/20)		SE	12	6	26
			Range	548- 585	420- 642	545- 596
			Sample Size	3	58	2
		F	Mean Length	482	569	578
			SE	-	4	4
			Range	482- 482	499- 680	567- 593
			Sample Size	1	75	6
	Season[a]	M	Mean Length	534	555	553
			Range	474- 585	385- 642	508- 596
			Sample Size	13	228	6
		F	Mean Length	546	560	560
			Range	482- 580	435- 680	415- 621
			Sample Size	8	199	22

Note: The sum of the sample sizes in each stratum equal the total sample size reported for that stratum in Table 4.

[a] "Season" mean lengths are weighted by the escapement passage in each stratum.

Figure 1.–Kuskokwim Area salmon management districts and escapement monitoring projects.

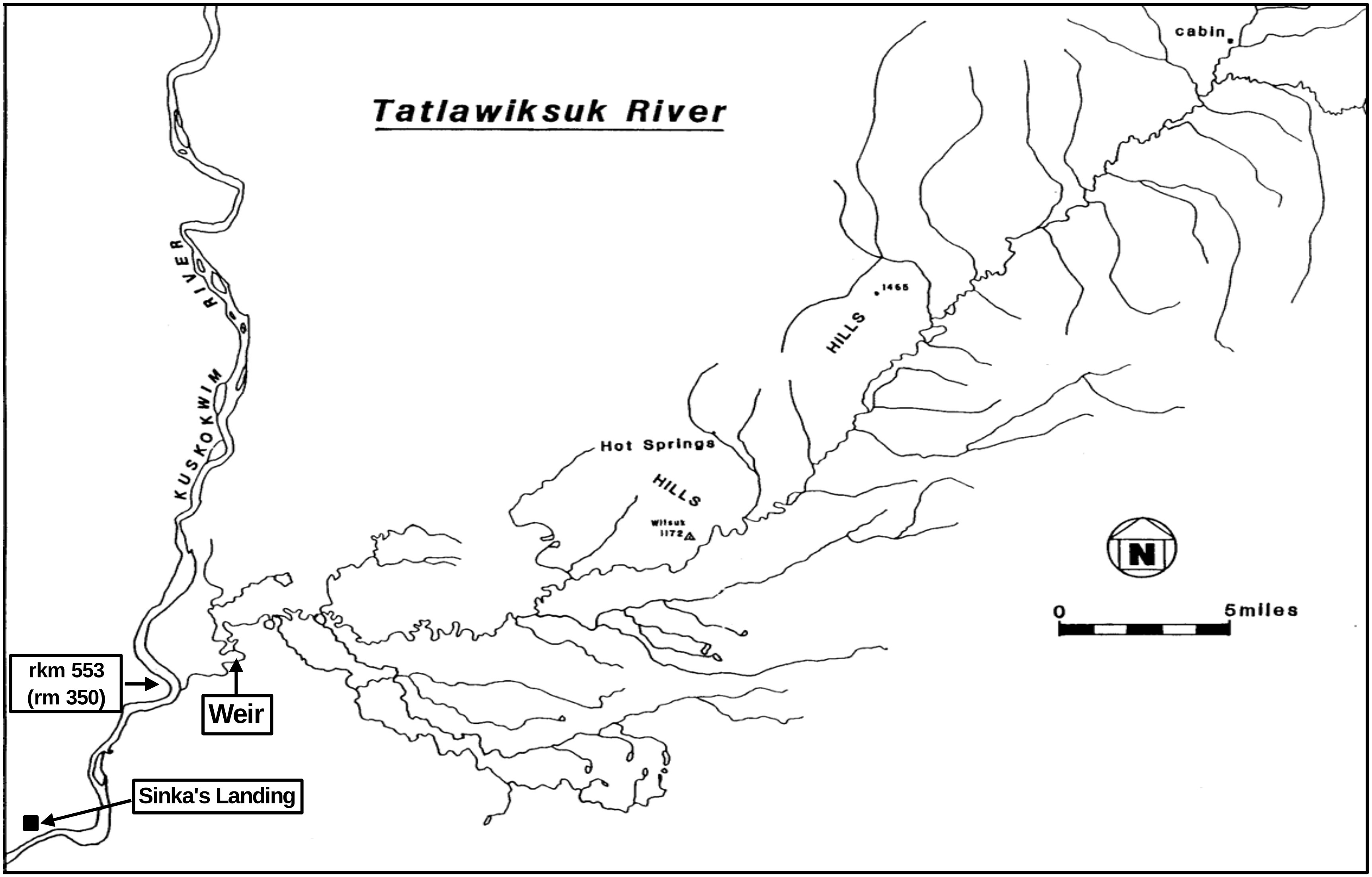
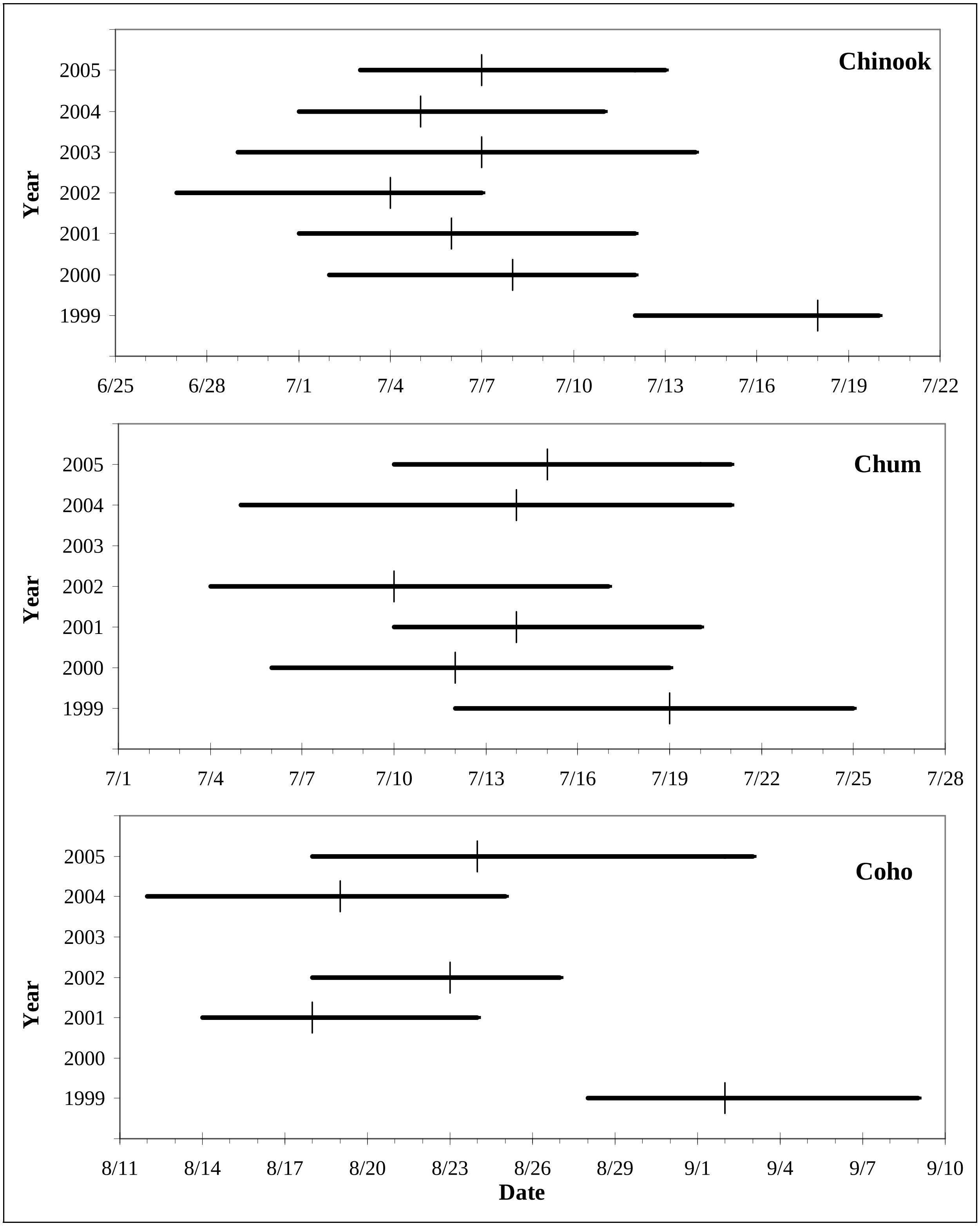


Figure 2.–Tatlawiksuk River drainage and project location.



Note: Horizontal black lines represent dates when the central fifty percent of the run passed and cross-bars represent median passage dates**.**

Figure 3.–Historical annual run timing of Chinook, chum, and coho salmon based on cumulative percent passage at Tatlawiksuk River weir, 1999–2005.

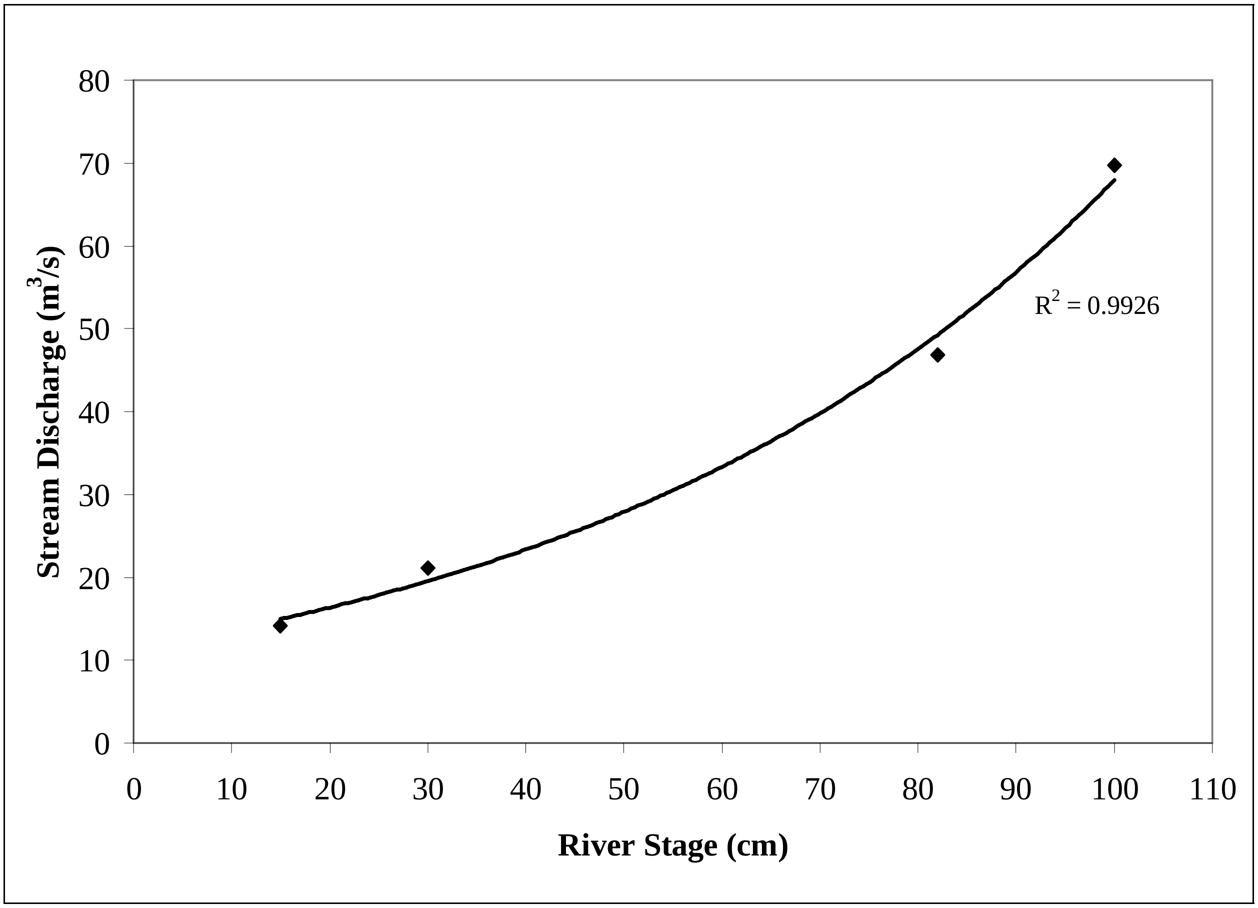


Figure 4.–Stream discharge (m^3/s) plotted against river stage (cm) at Tatlawiksuk River weir, 2005.

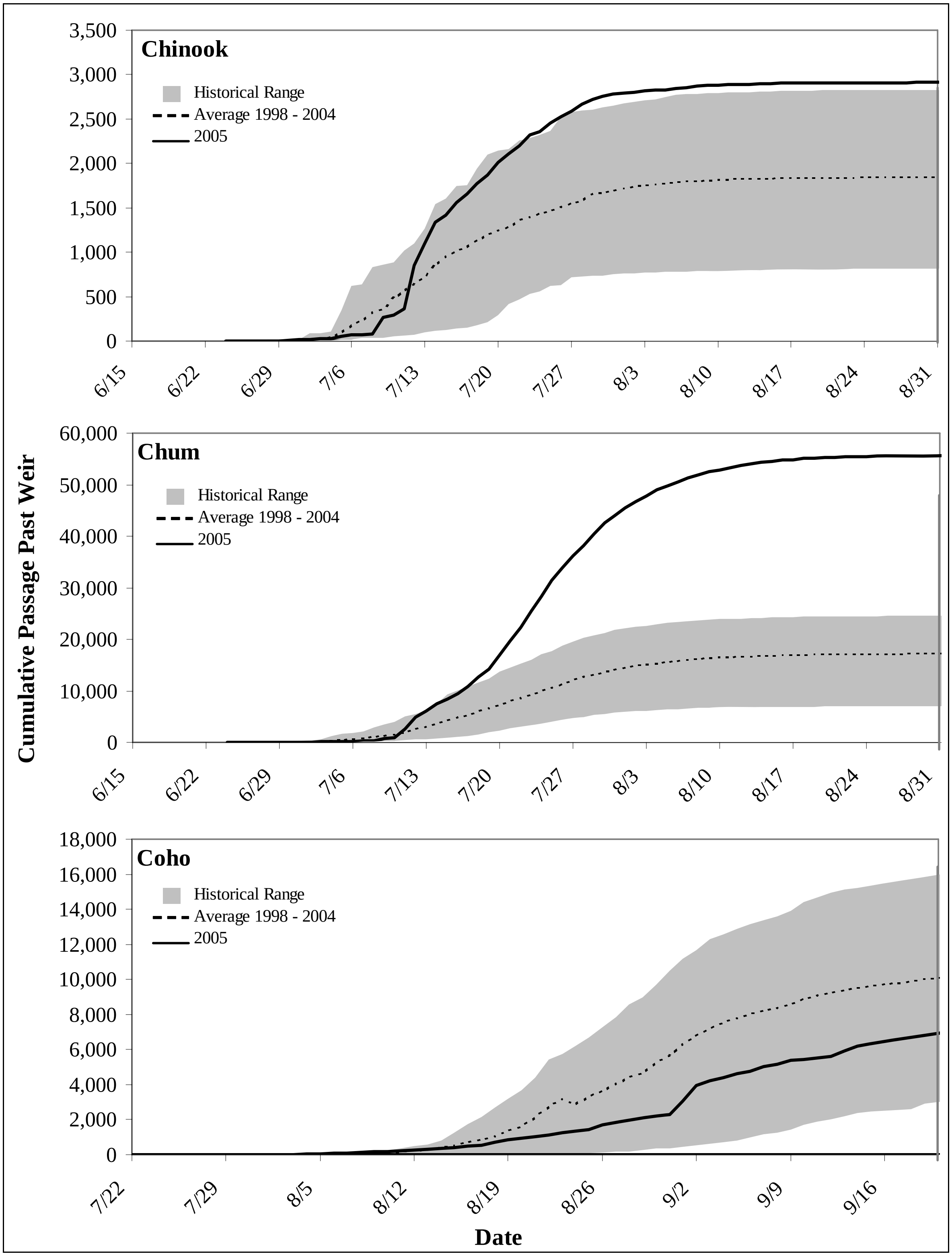


Figure 5.–Historical cumulative passage of Chinook, chum, and coho salmon past Tatlawiksuk River weir, 1998–2005.

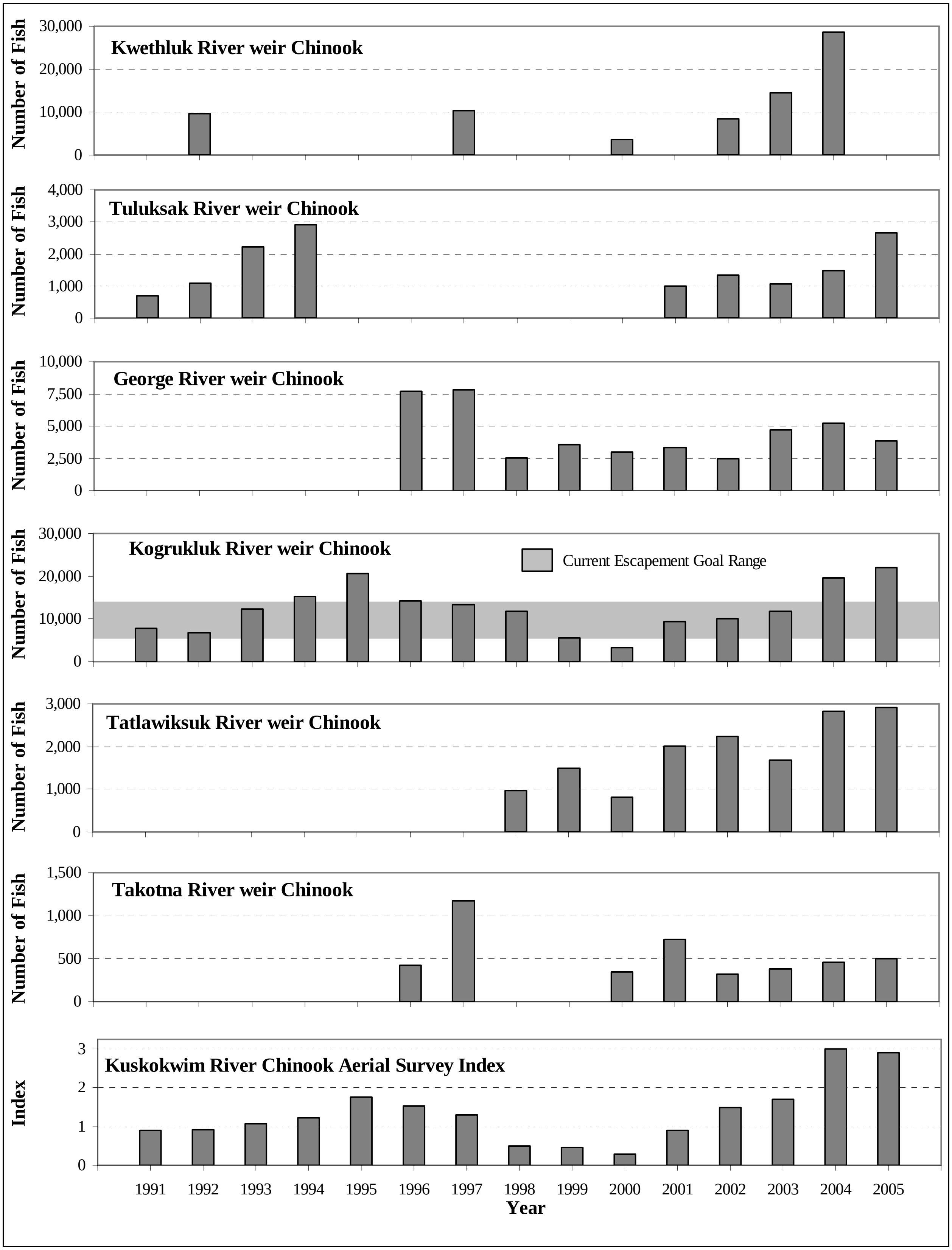


Figure 6.–Historical Chinook salmon escapement into six Kuskokwim River tributaries, and the Kuskokwim River Chinook salmon aerial survey indices, 1991–2005.

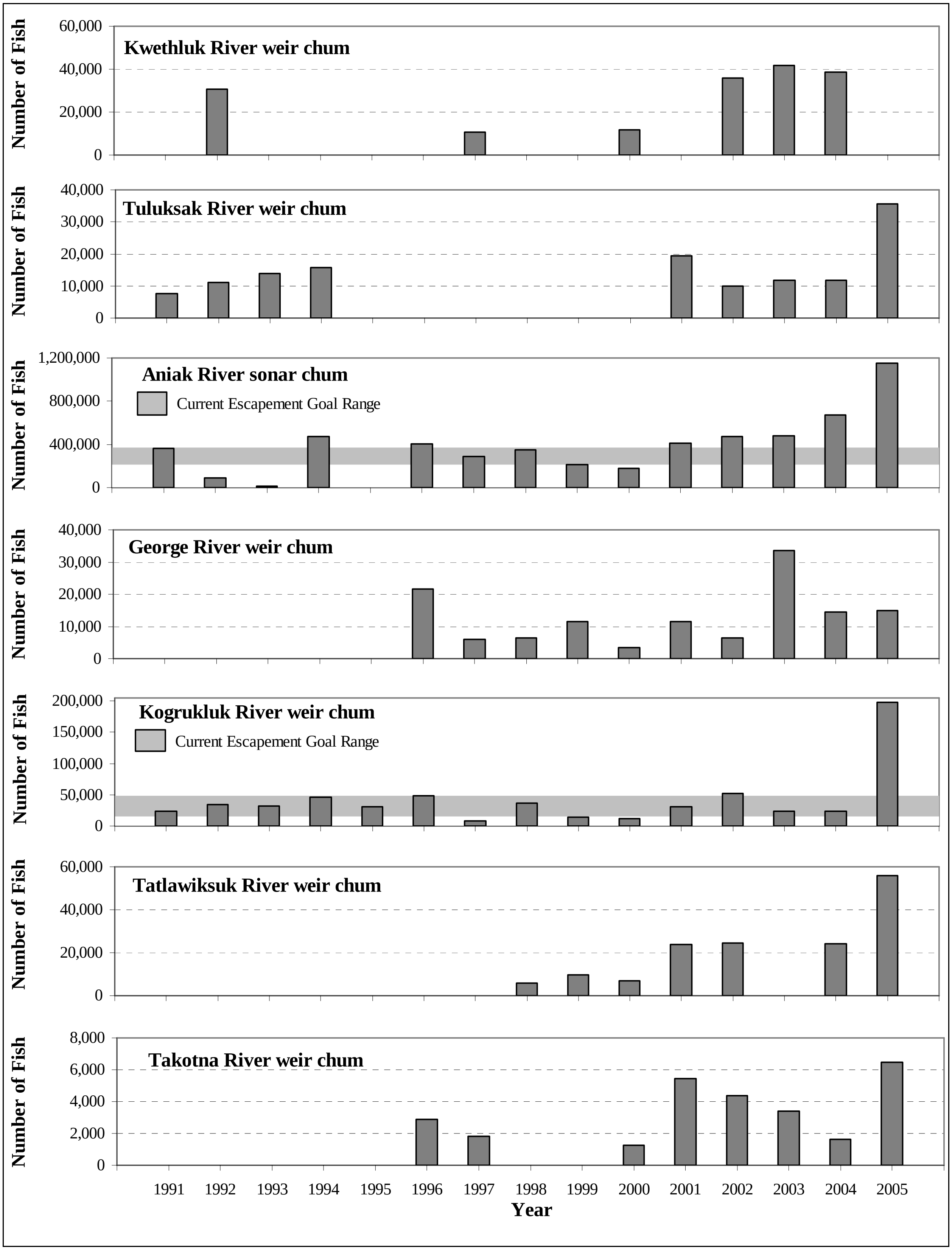


Figure 7.–Historical annual chum salmon escapement into seven Kuskokwim River tributaries, 1991–2005.

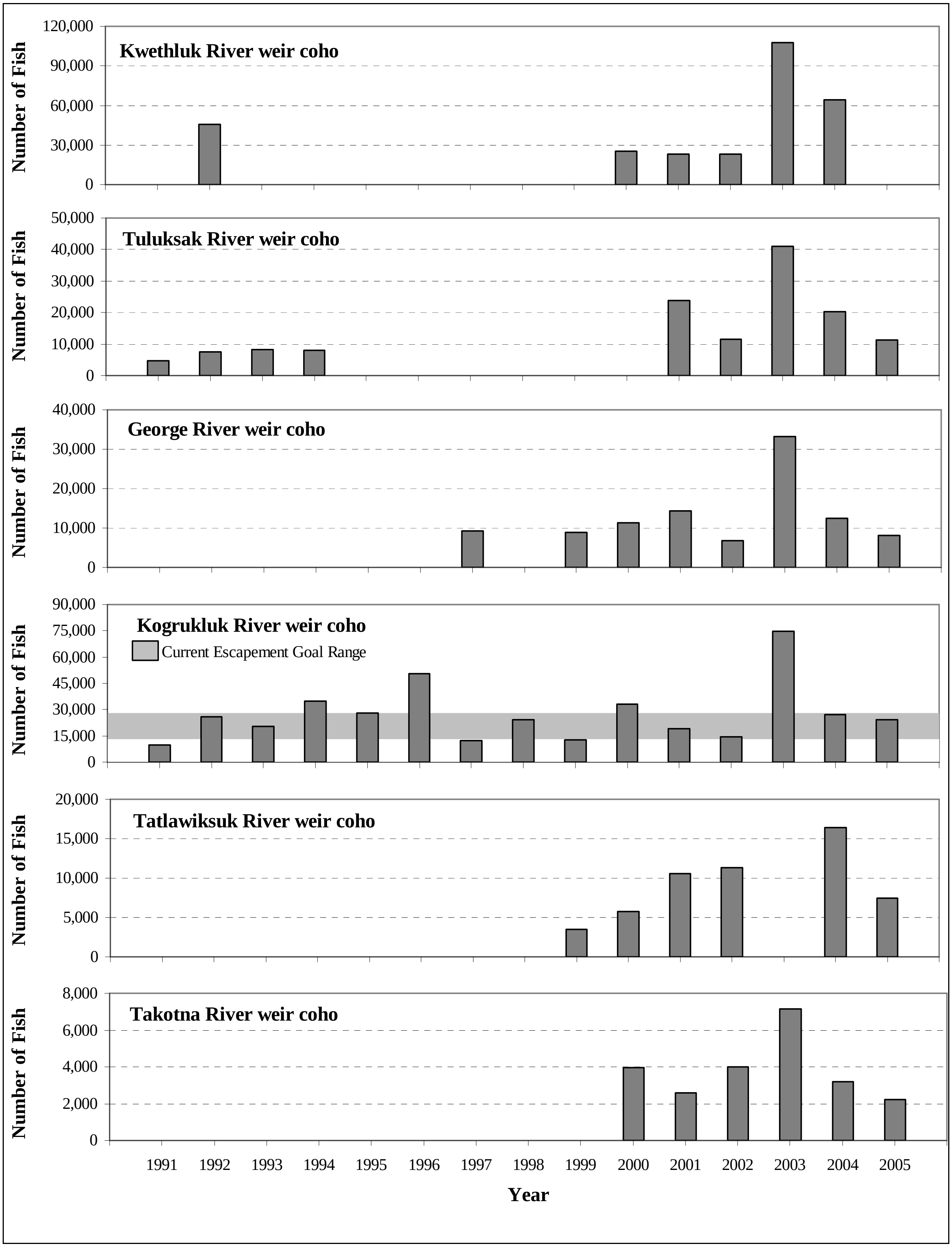


Figure 8.–Historical coho salmon escapement into six Kuskokwim River tributaries, 1991–2005.

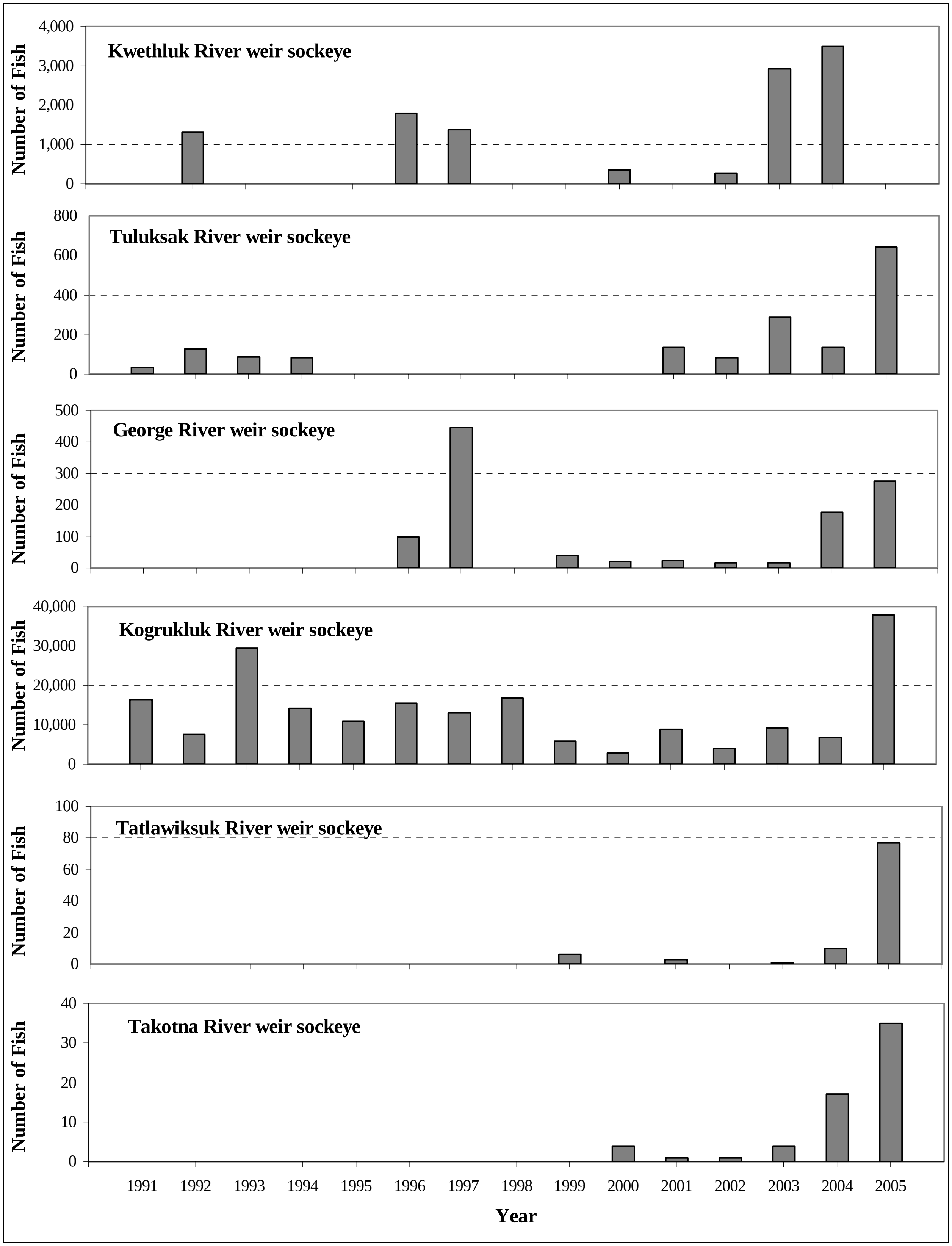


Figure 9.–Historical annual sockeye salmon escapement into six Kuskokwim River tributaries, 1991–2005.

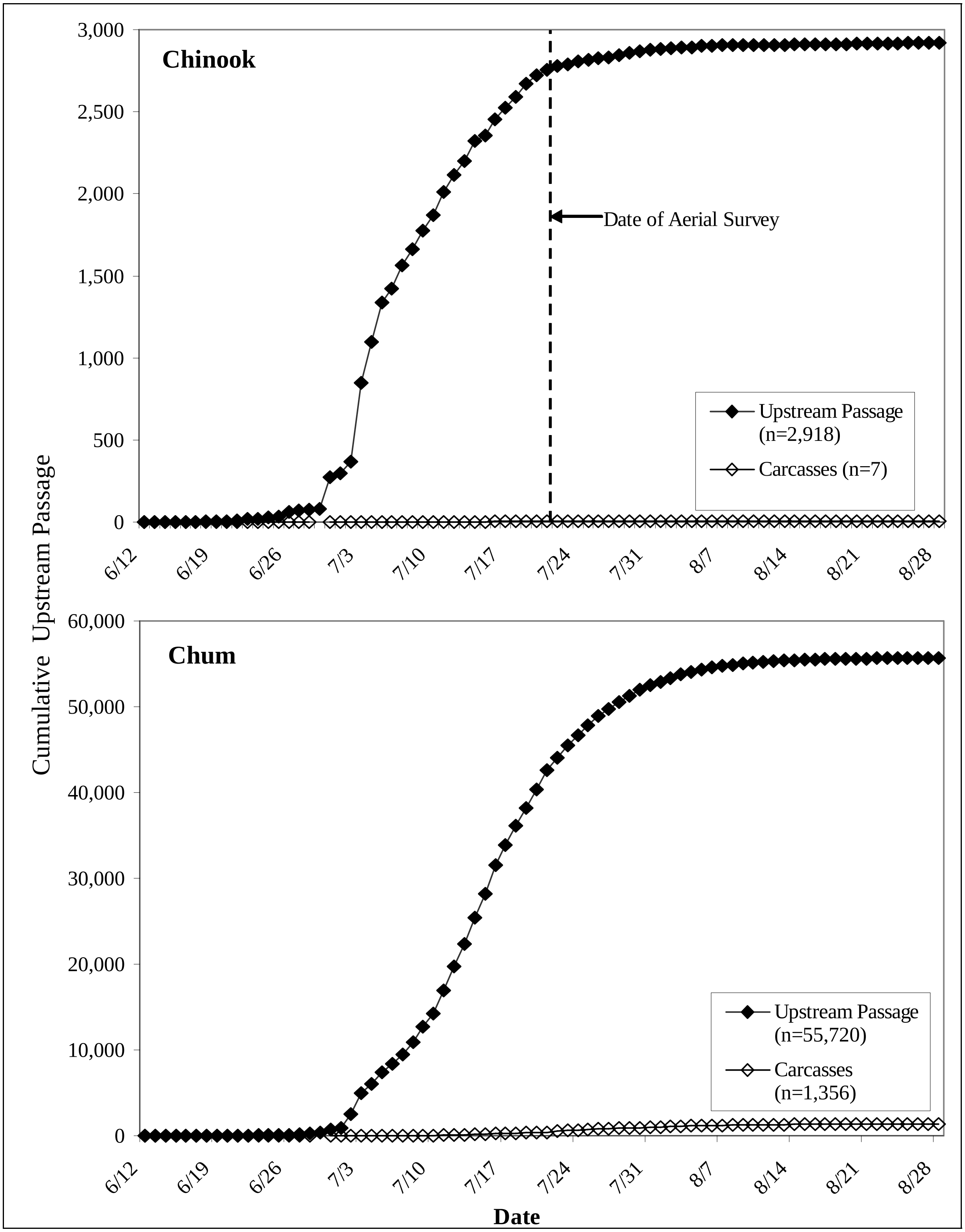
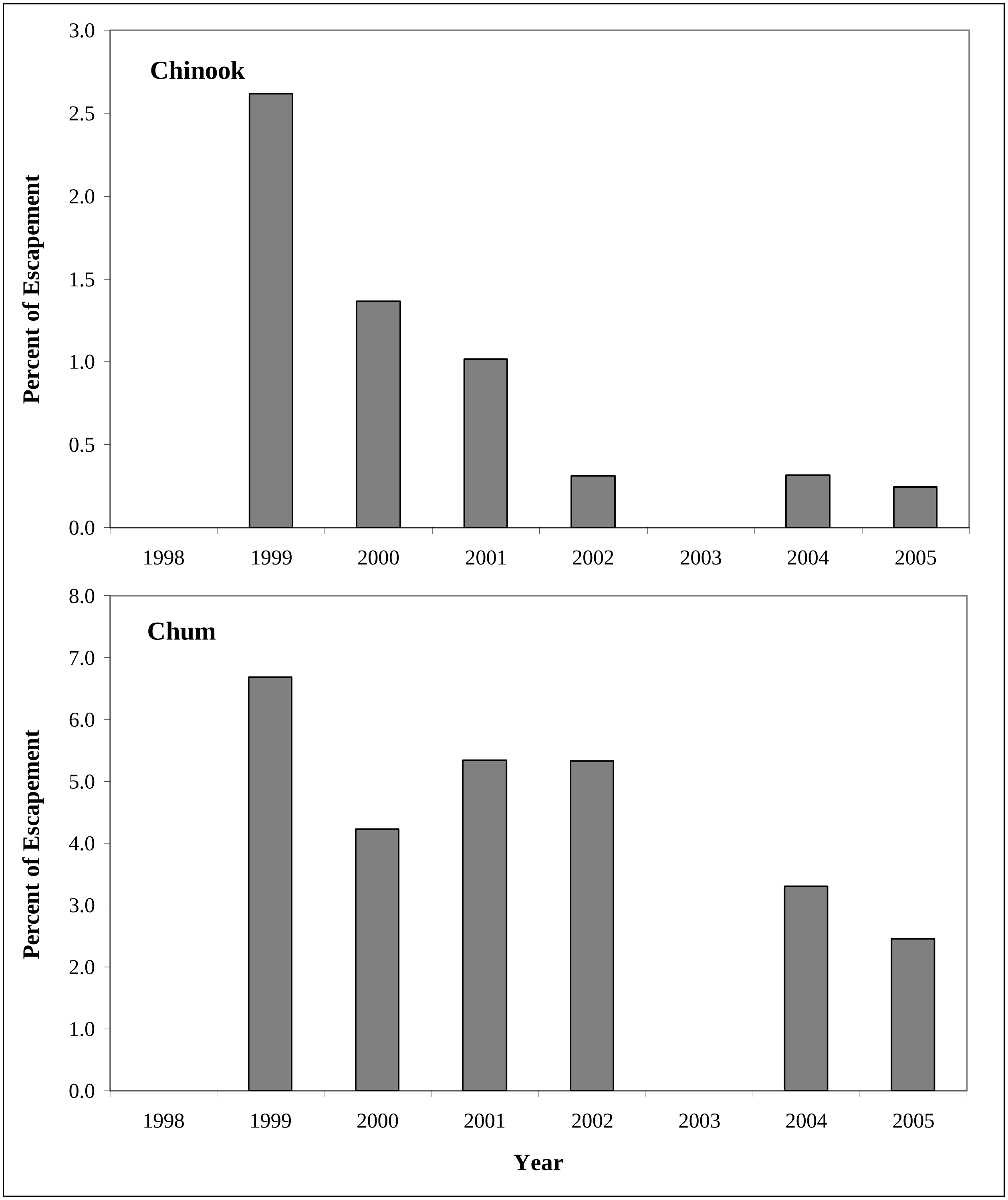


Figure 10.–Historical percentage of Chinook and chum salmon escapement that returned to Tatlawiksuk River weir as carcasses, 1998–2005.



Note: Percentage calculations were performed using observed passage and not estimated passage because estimates are not made for carcasses. In 1998 and 2003 the weir was inoperable for most of the season and passage and carcass counts are not available. In 2000 the weir was inoperable from 15 August onward; carcass counts are incomplete.

Figure 11.–Historical percentage of Chinook and chum salmon escapement that returned to Tatlawiksuk River weir as carcasses, 1998–2005.

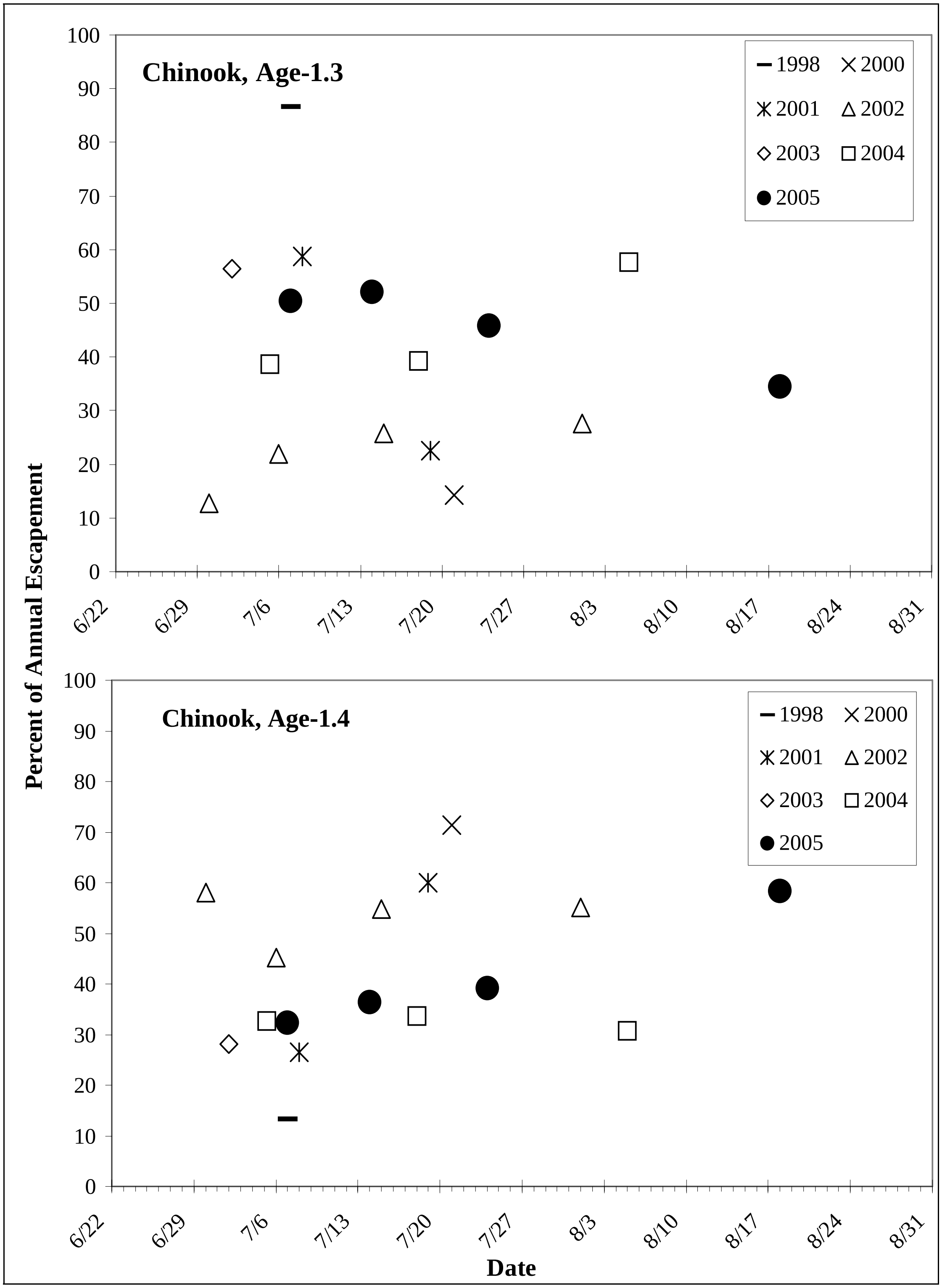


Figure 12.–Historical age composition by sample date for Chinook salmon at the Tatlawiksuk River weir, 1998–2005.

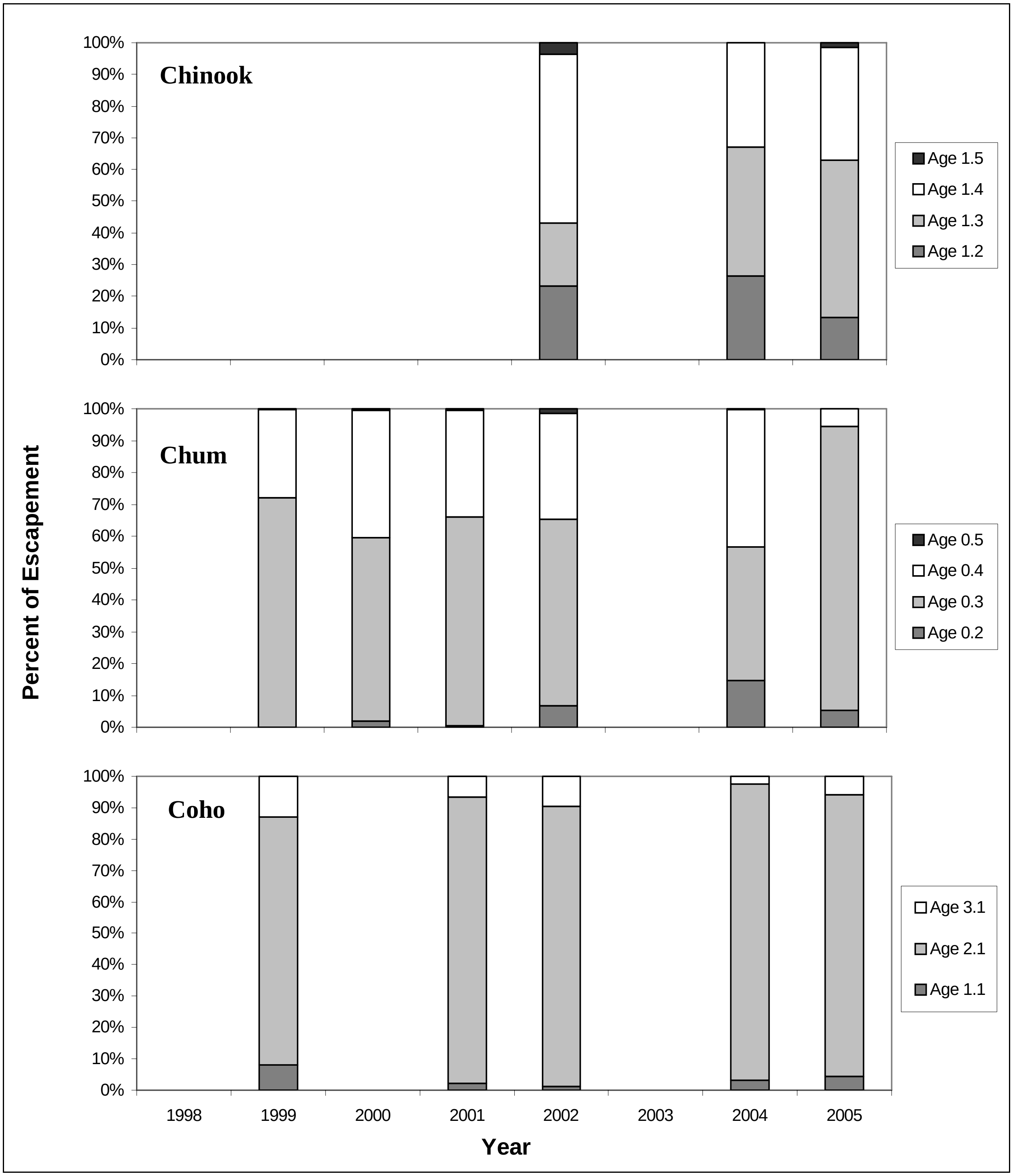
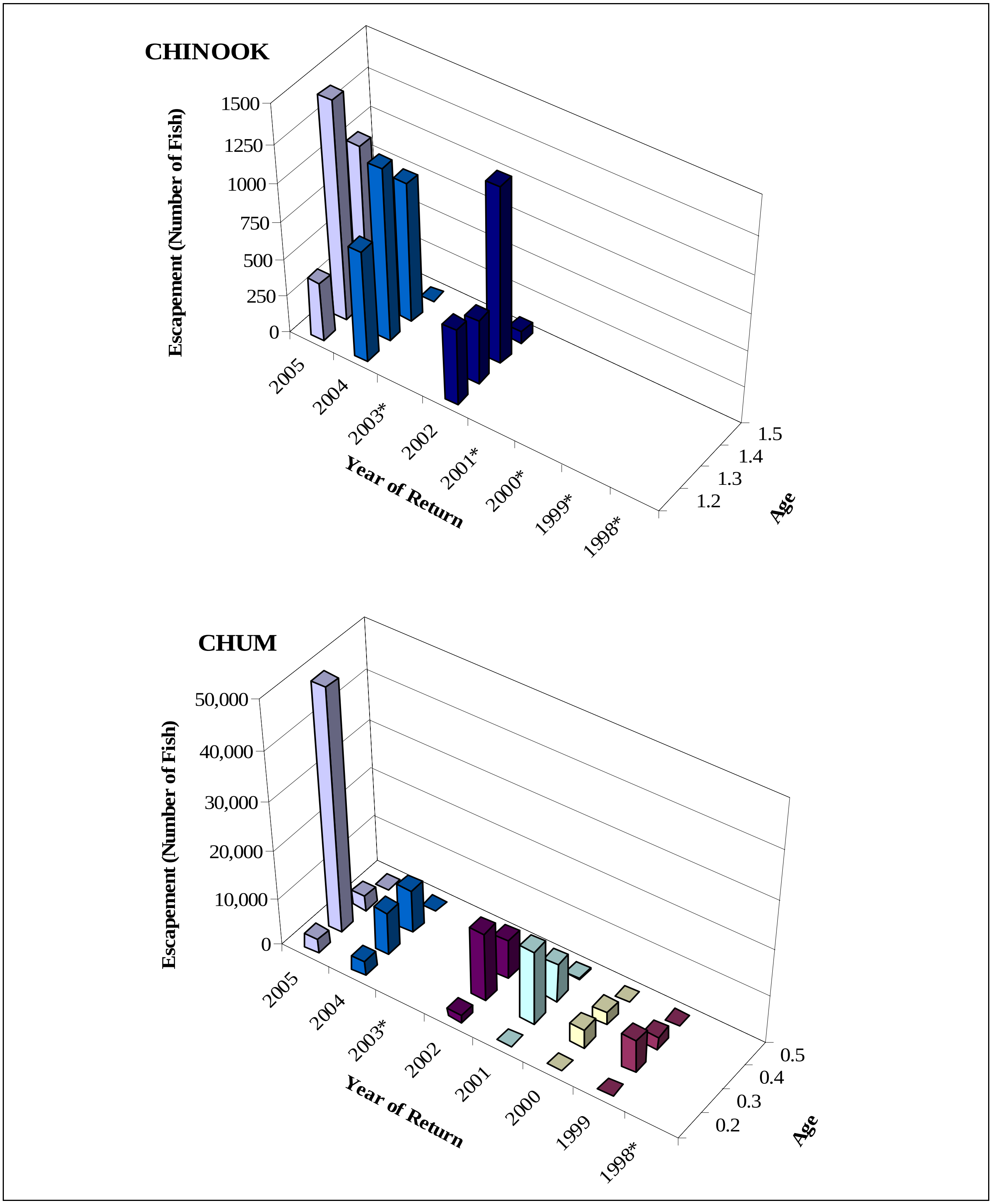


Figure 13.–Historical age composition of Chinook, chum, and coho salmon at the Tatlawiksuk River weir, 1998–2005.



Note: An asterisk (*) denotes incomplete sampling or escapement estimates.

Figure 14.–Historical Chinook and chum salmon age distribution at Tatlawiksuk River weir.

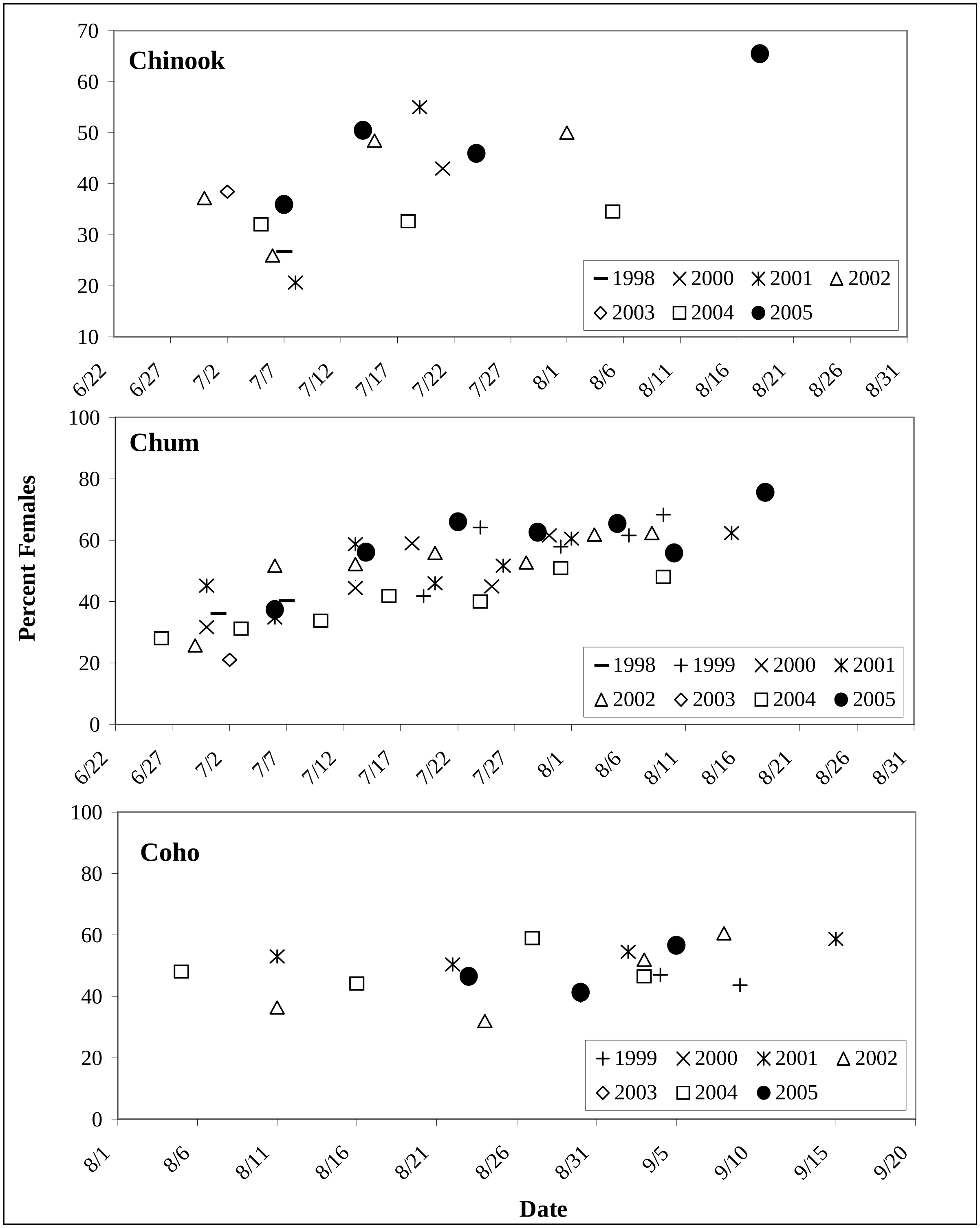


Figure 15.–Historical percentage of female Chinook, chum, and coho salmon by sample date at Tatlawiksuk River weir.

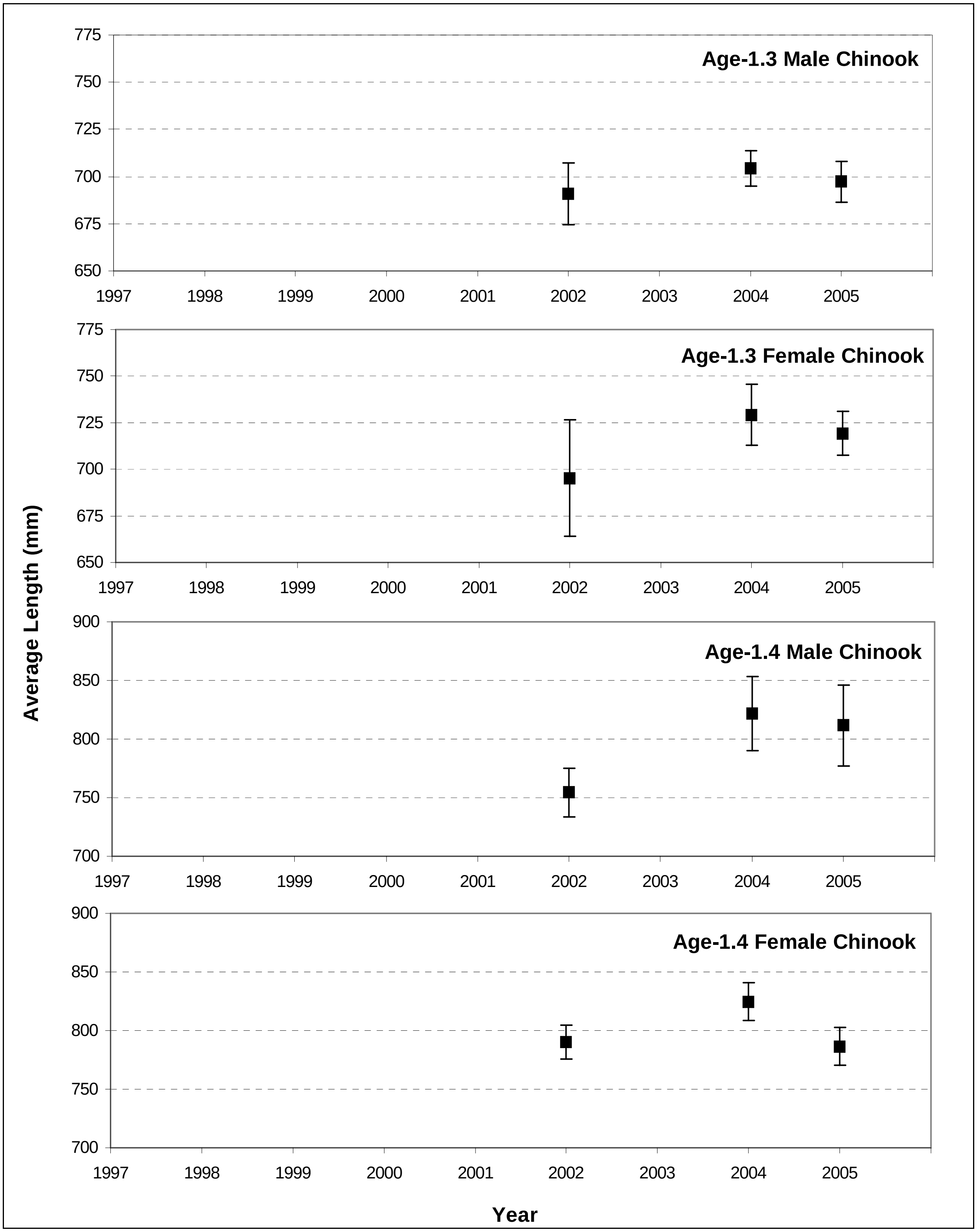


Figure 16.–Historical average annual length for Chinook salmon at Tatlawiksuk River weir, with 95% confidence intervals.

Note: Years with an asterisk (*) were not included due to insufficient data.

Figure 17.–Historical average annual length of male and female Chinook salmon at the Tatlawiksuk River weir, by age class.

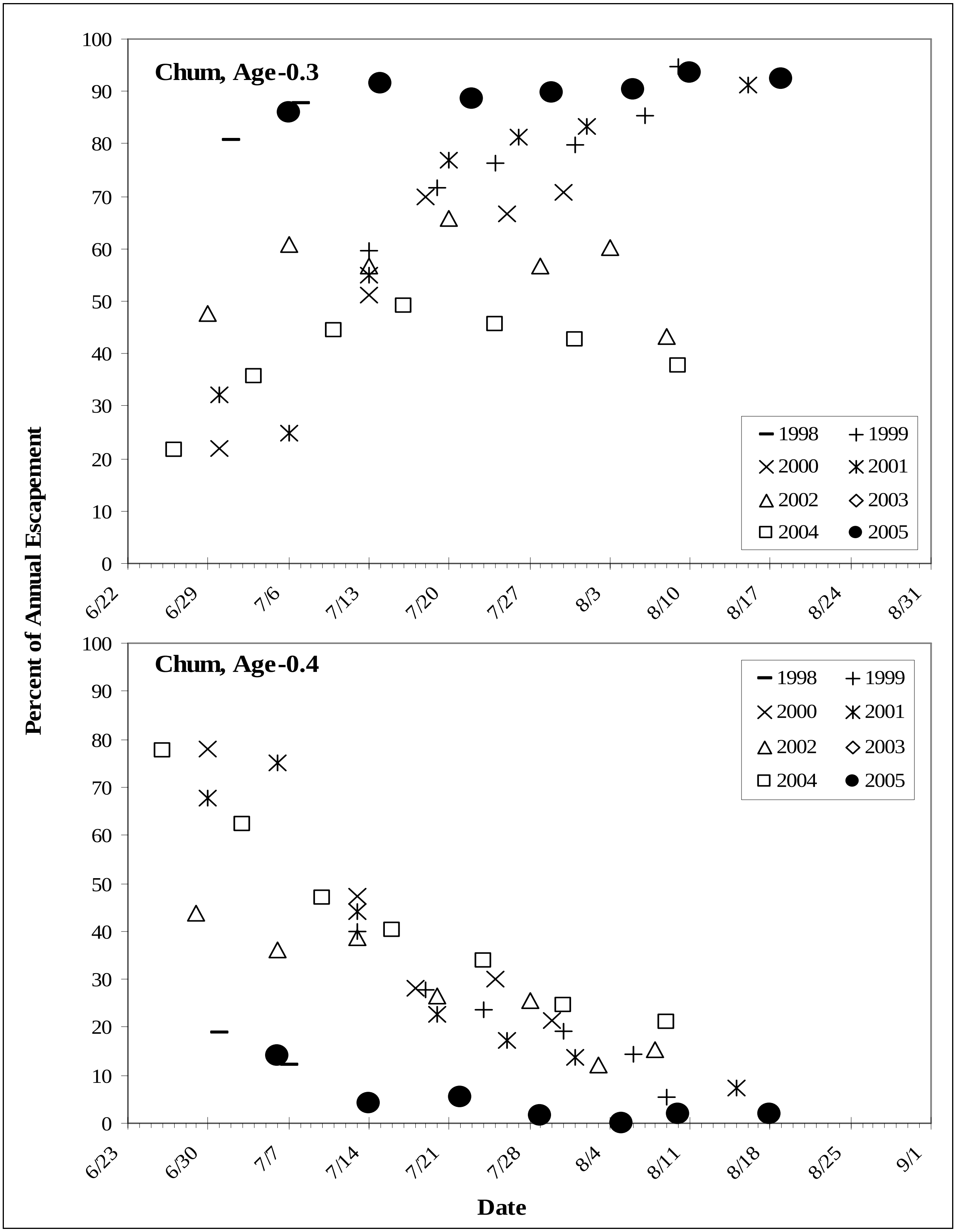


Figure 18.–Historical age composition by sample date for chum salmon at the Tatlawiksuk River weir.

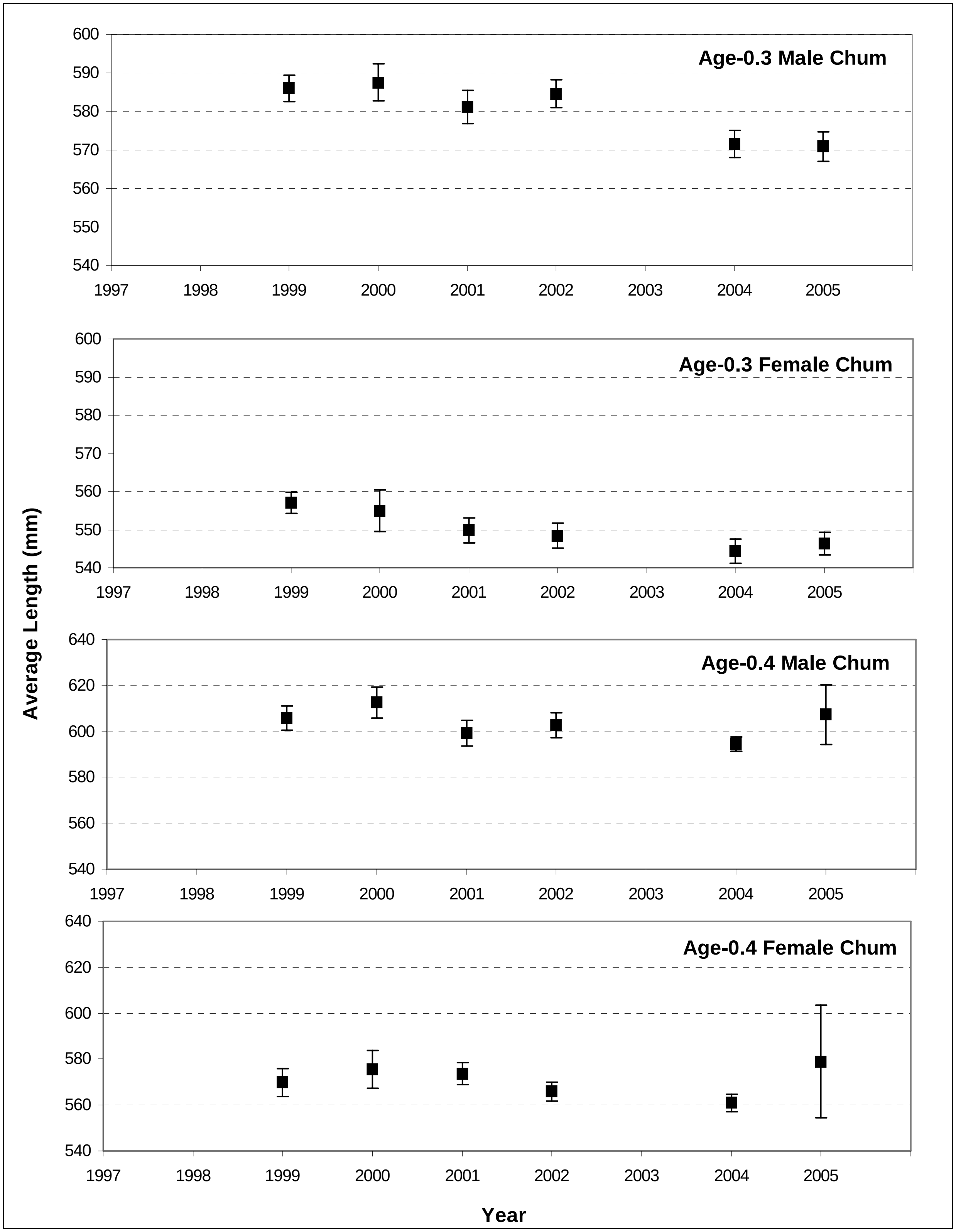
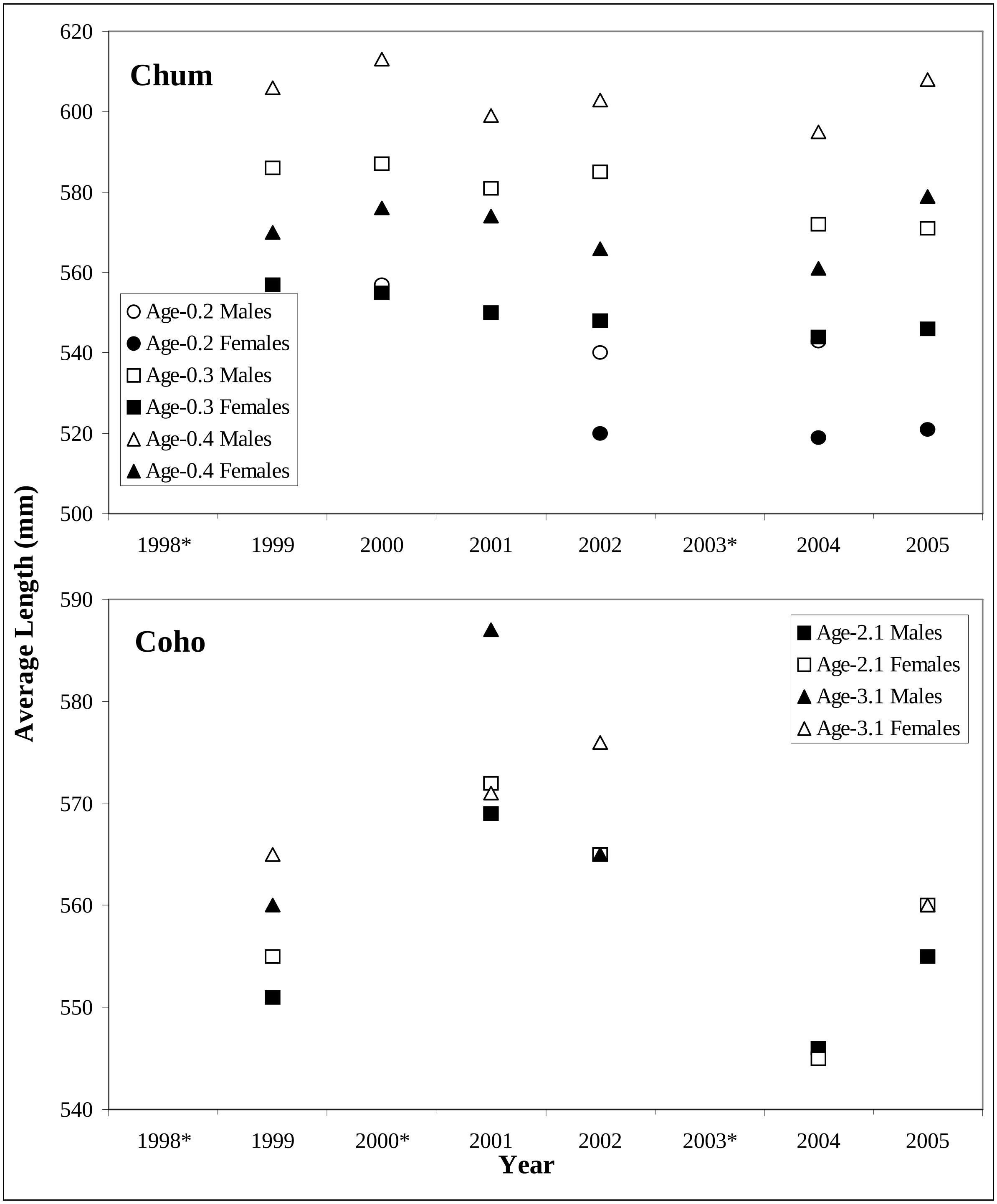


Figure 19.–Historical average annual length of chum salmon at the Tatlawiksuk River weir, with 95% confidence intervals.



Note: Years with an asterisk (*) were not included due to insufficient data.

Figure 20.–Historical average annual length of male and female chum and coho salmon at the Tatlawiksuk River weir, by age class.

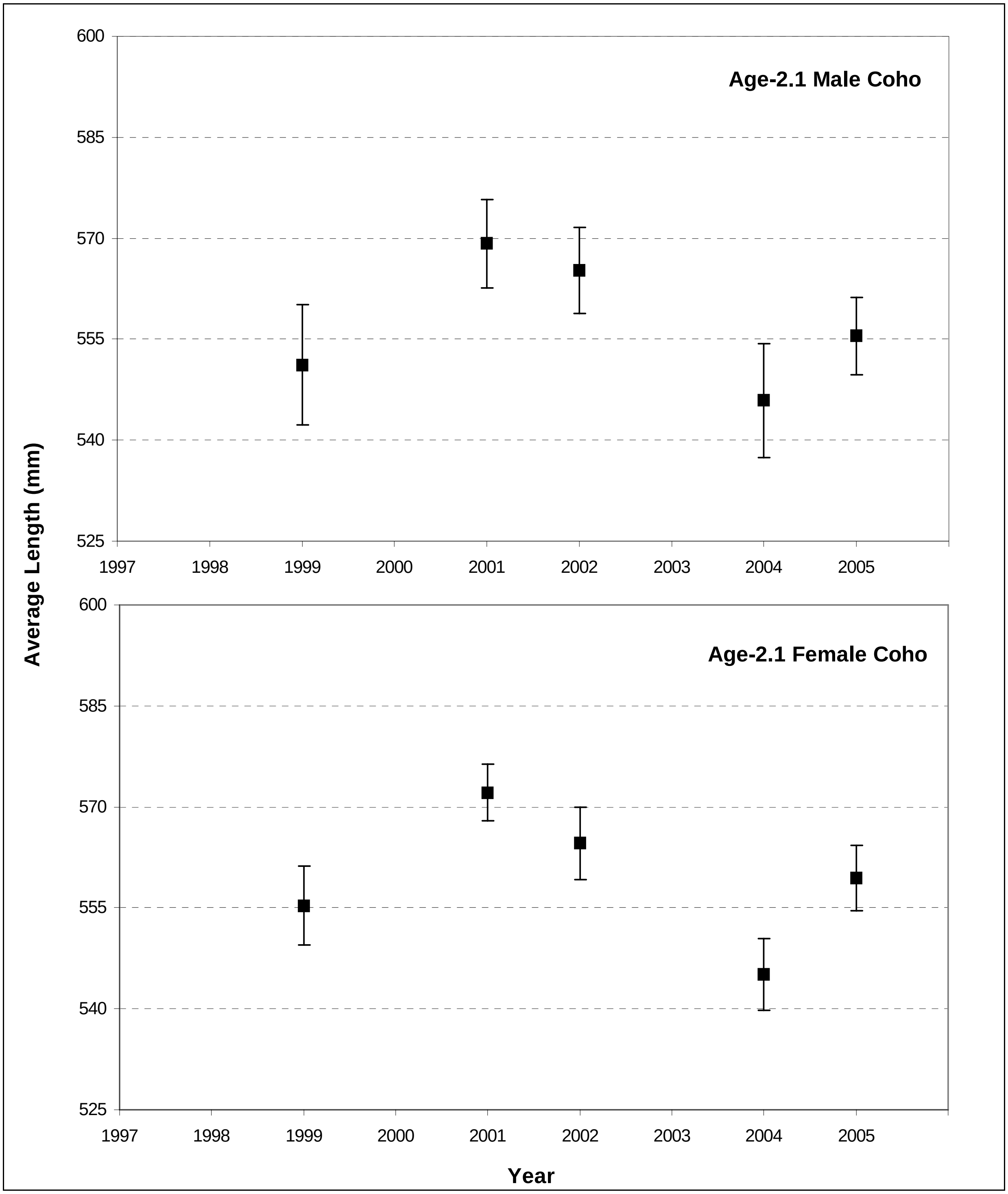


Figure 21.–Historical average annual length for coho salmon at Tatlawiksuk River weir, with 95% confidence intervals.

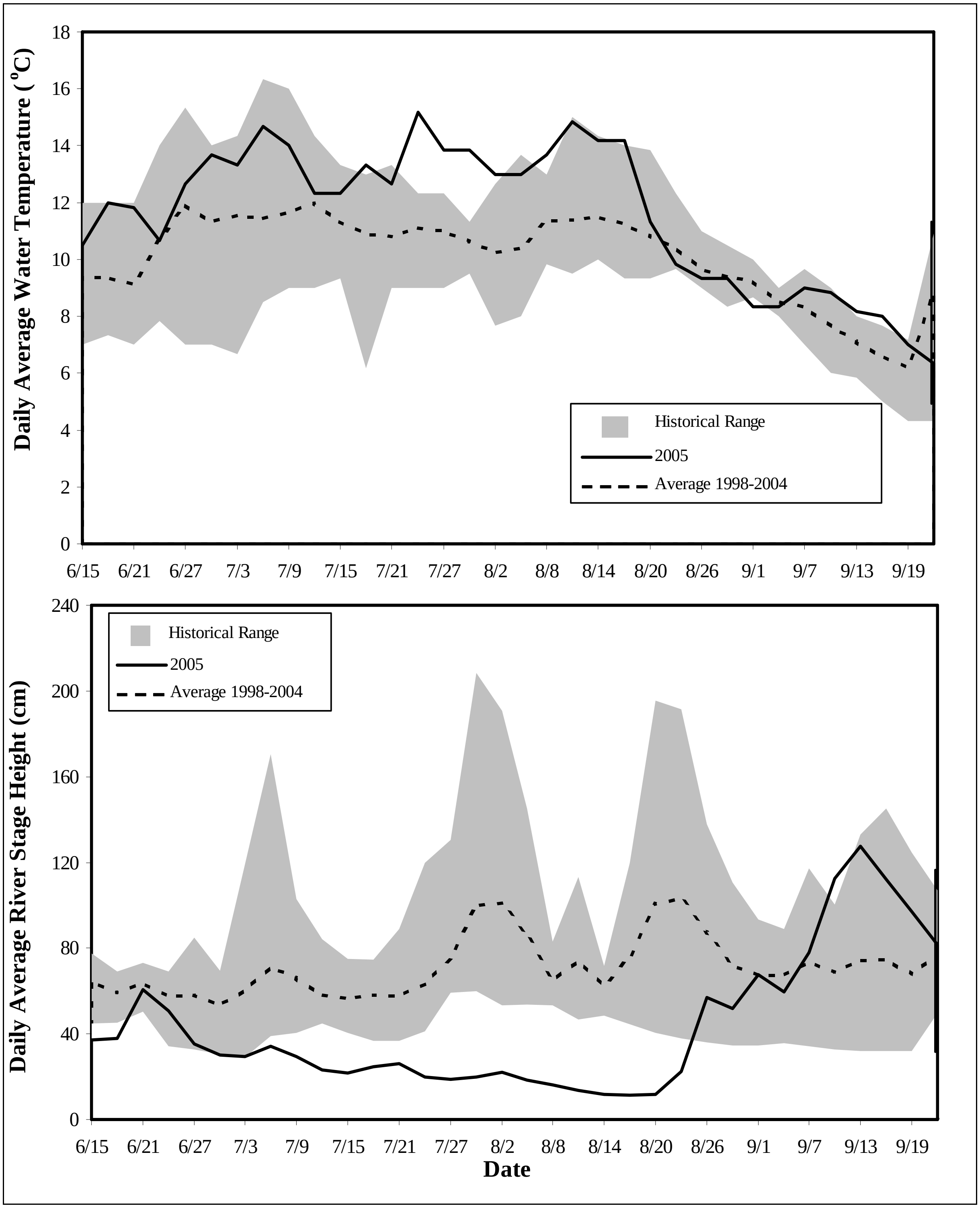


Figure 22.–Historical average, minimum, and maximum daily water temperature (observed thermometer measurements) and river stage at the Tatlawiksuk River weir from 1998–2004, compared to daily average water temperature and river stage in 2005.

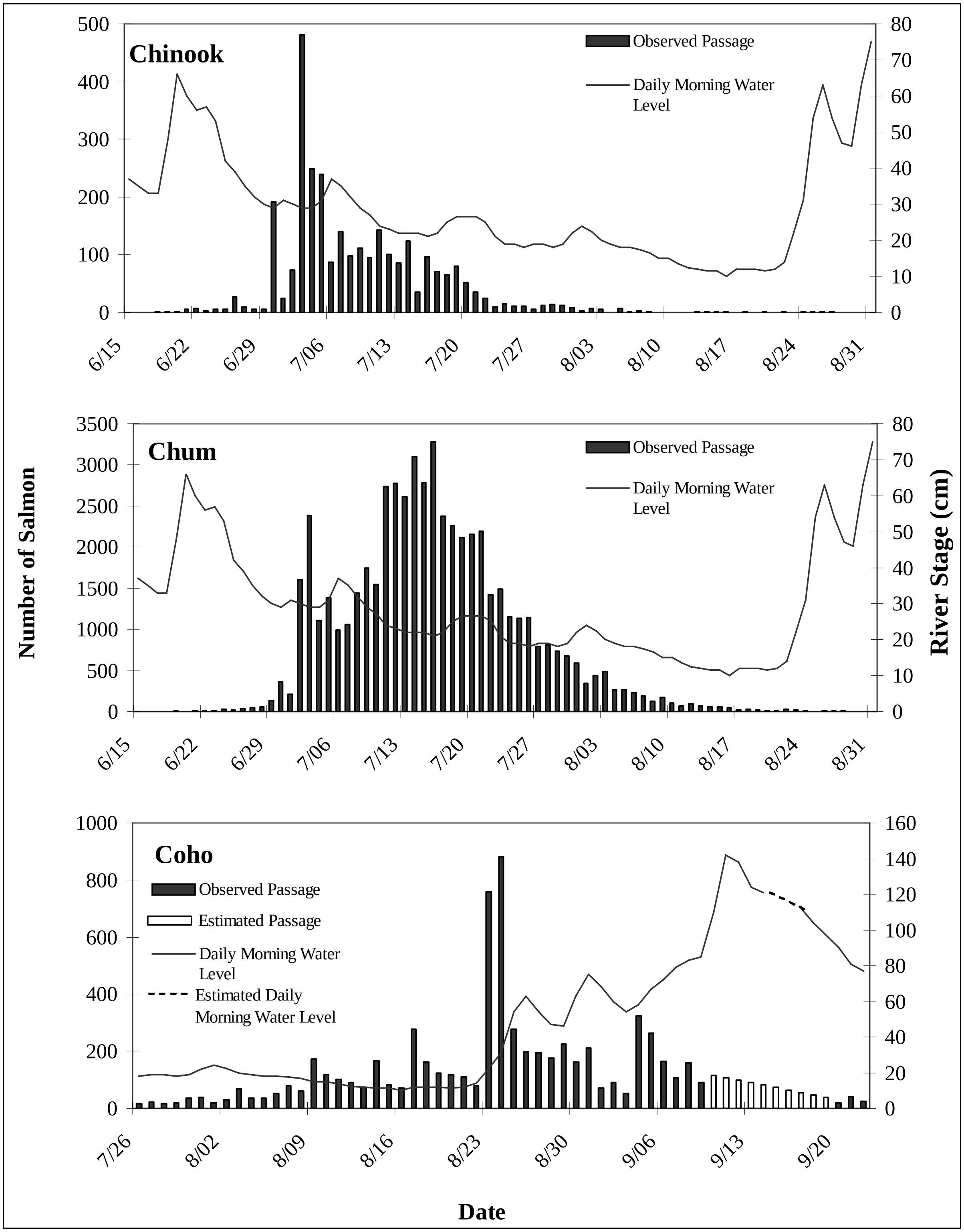


Figure 23.–Daily Chinook, chum, and coho salmon passage at Tatlawiksuk River weir relative to daily average river stage height, 2005.

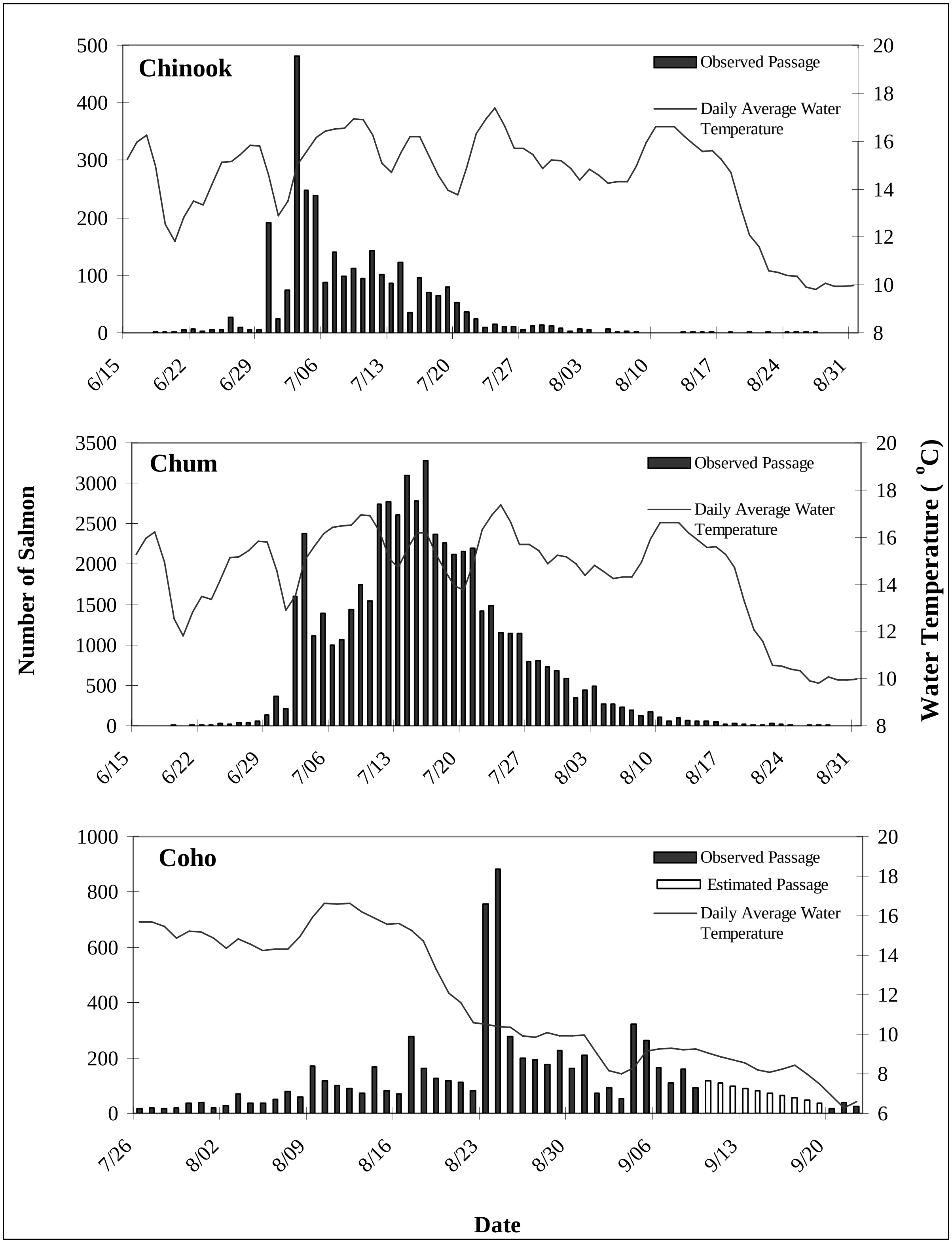
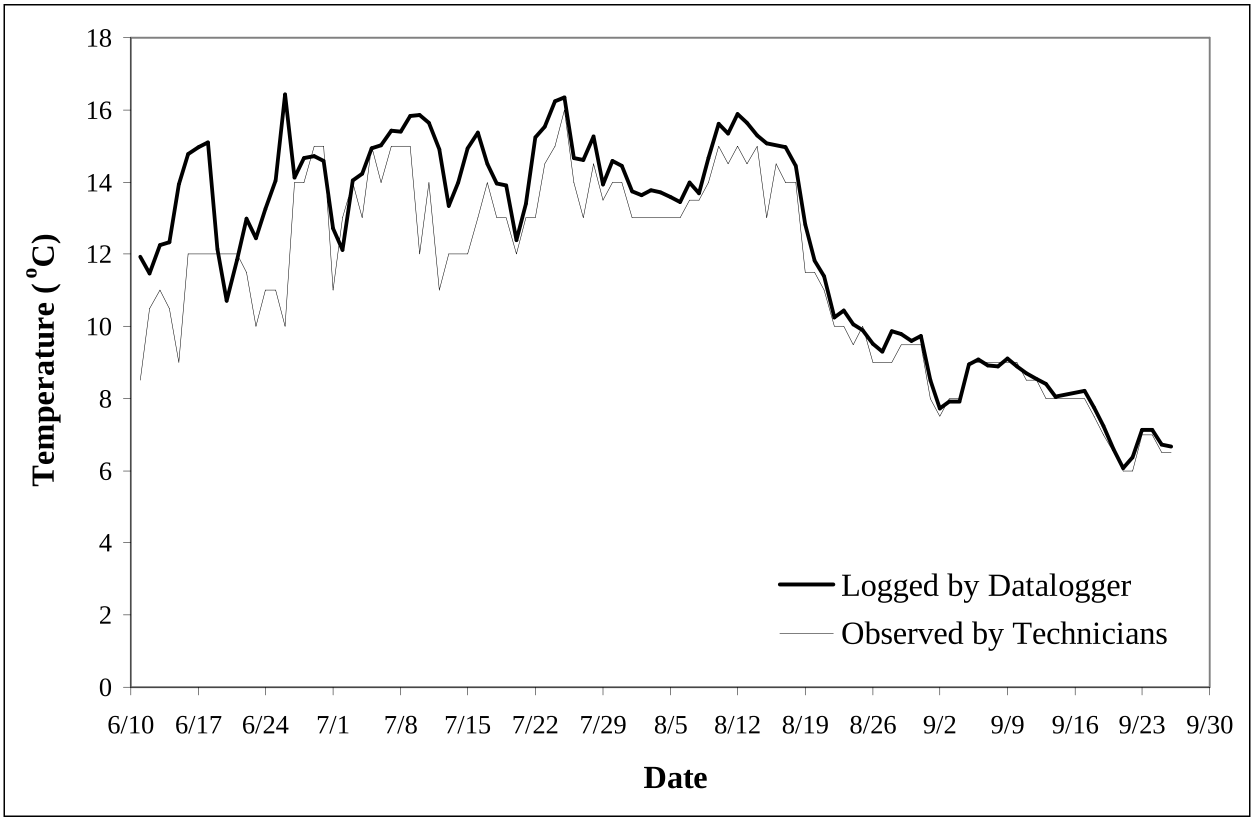


Figure 24.–Daily Chinook, chum, and coho salmon passage at Tatlawiksuk River weir relative to daily average water temperature (data logger readings), 2005.



Note: Observed water temperature measured using a thermometer was compared only with data logger readings from the same time.

Figure 25.–Daily morning water temperature logged by the data logger compared to daily morning water temperature from thermometer readings at the Tatlawiksuk River weir, 2005.

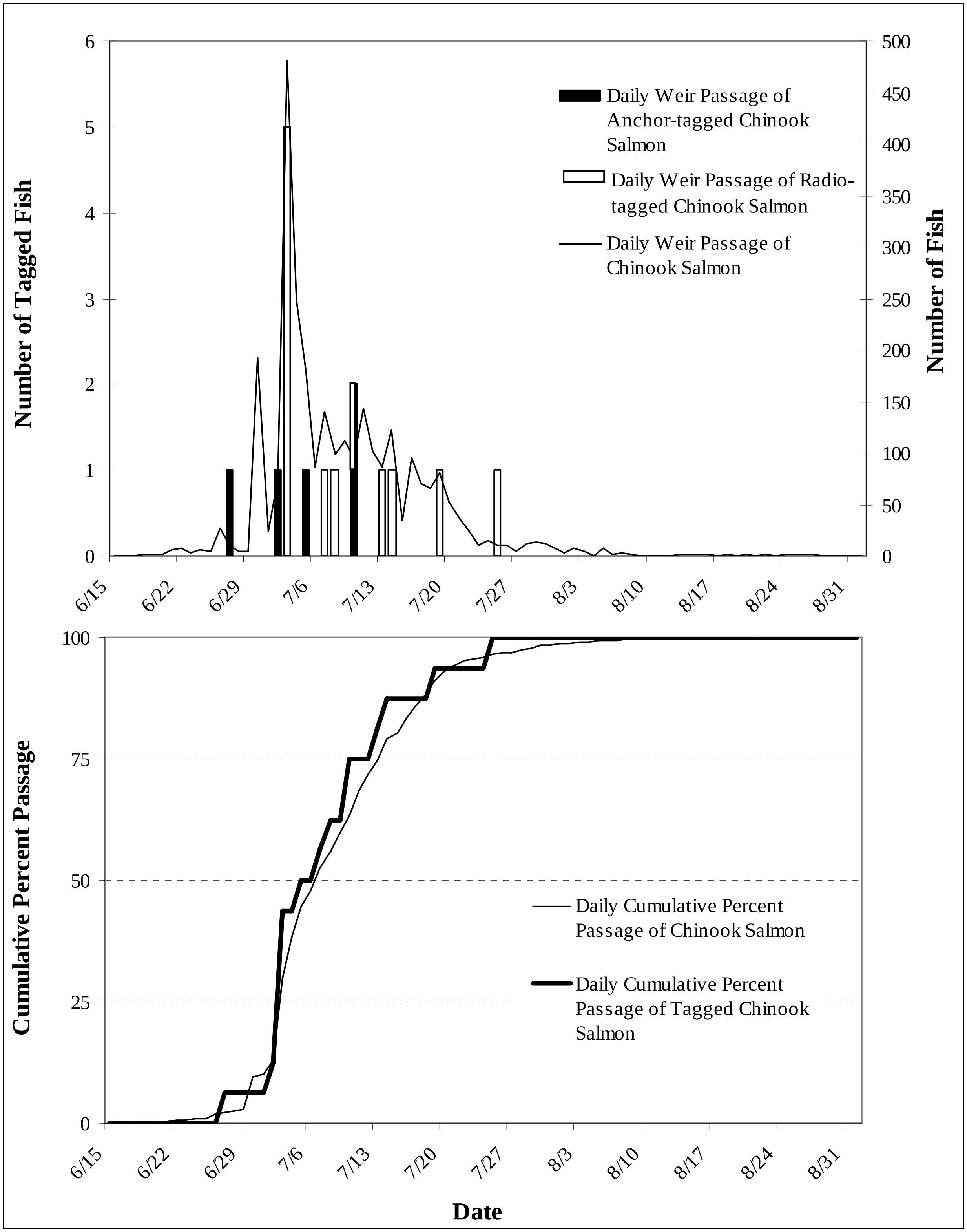
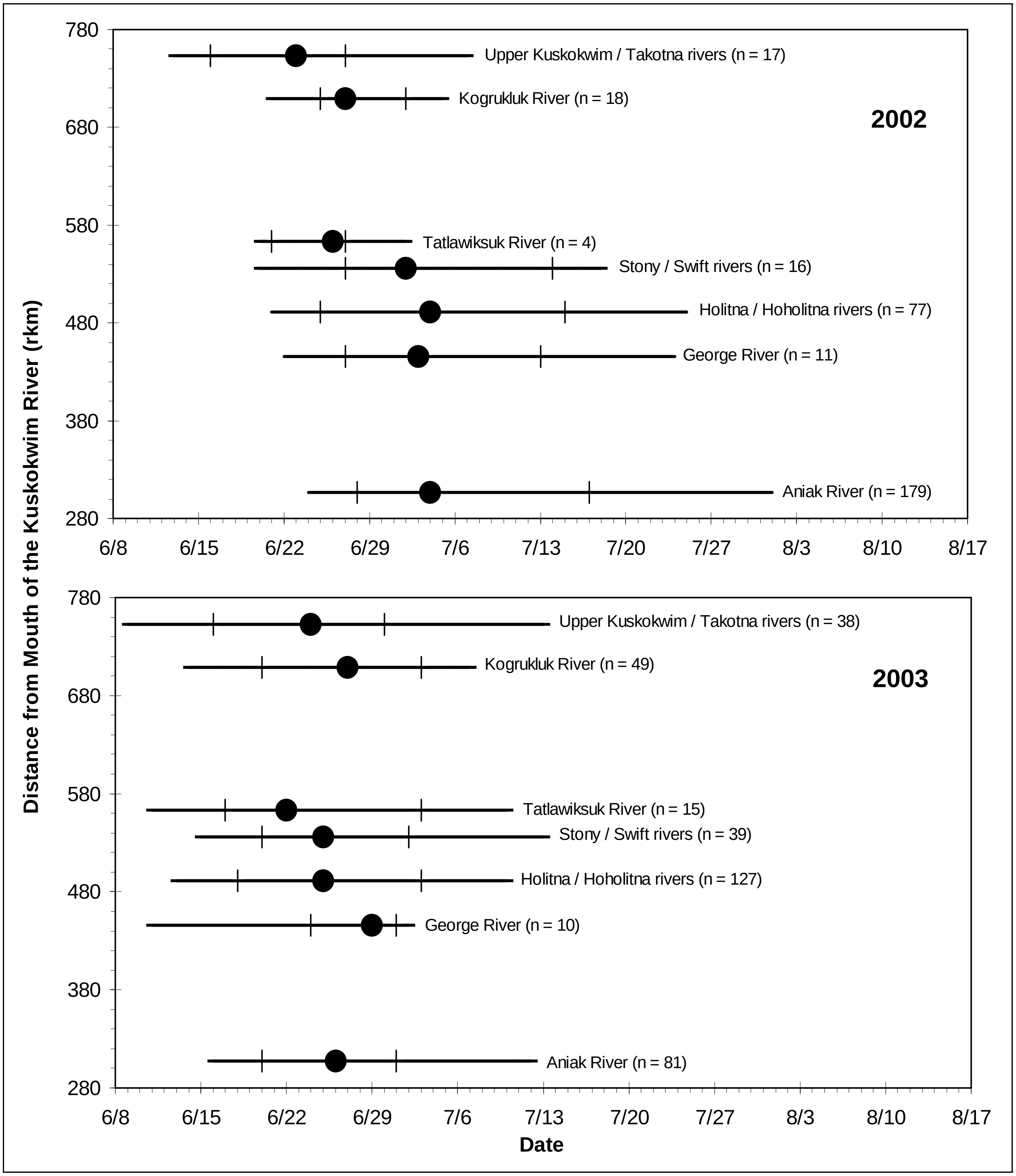
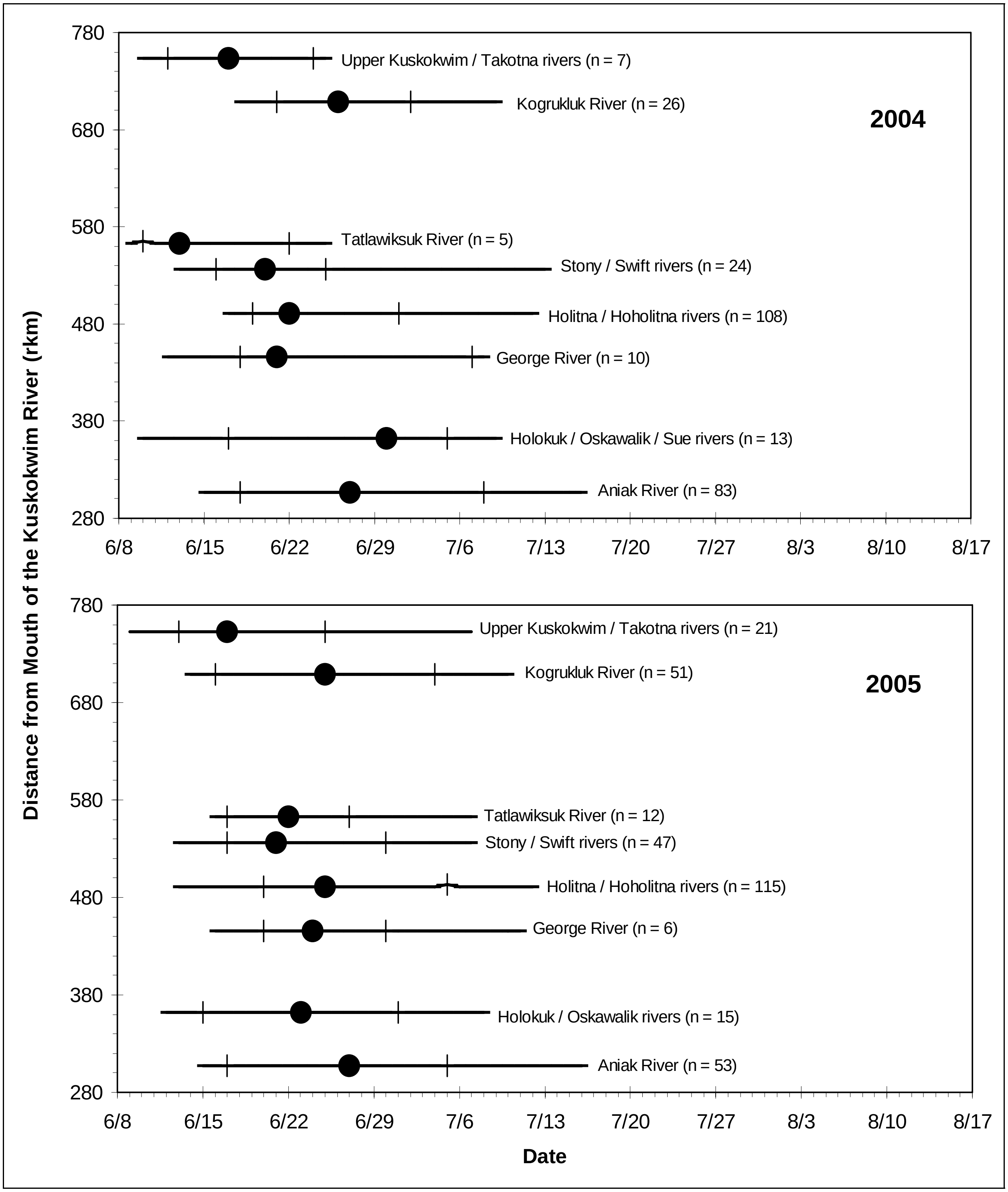


Figure 26.–Daily and cumulative percent passage of overall Chinook salmon passage compared to tagged Chinook salmon passage at the Tatlawiksuk River weir in 2005.



Note: Data for this analysis were collected as part of Inriver Abundance of Chinook Salmon in the Kuskokwim River (Stuby 2003 and 2004). Horizontal lines represent the central 80%, cross-bars represent the central 50%, and circles represent the median passage date for each stock. Distances are from marine waters.

Figure 27.–Dates when individual Chinook salmon stocks pass through the Kalskag tagging sites (rkm 271) based on radiotelemetry, 2002–2003.



Note: Data for this analysis were collected as part of Inriver Abundance of Chinook Salmon in the Kuskokwim River (Stuby 2005 and *In prep*). Horizontal lines represent the central 80%, cross-bars represent the central 50%, and circles represent the median passage date for each stock. Distances are from marine waters.

Figure 28.–Dates when individual Chinook salmon stocks pass through the Kalskag tagging sites (rkm 271) based on radiotelemetry, 2004–2005.

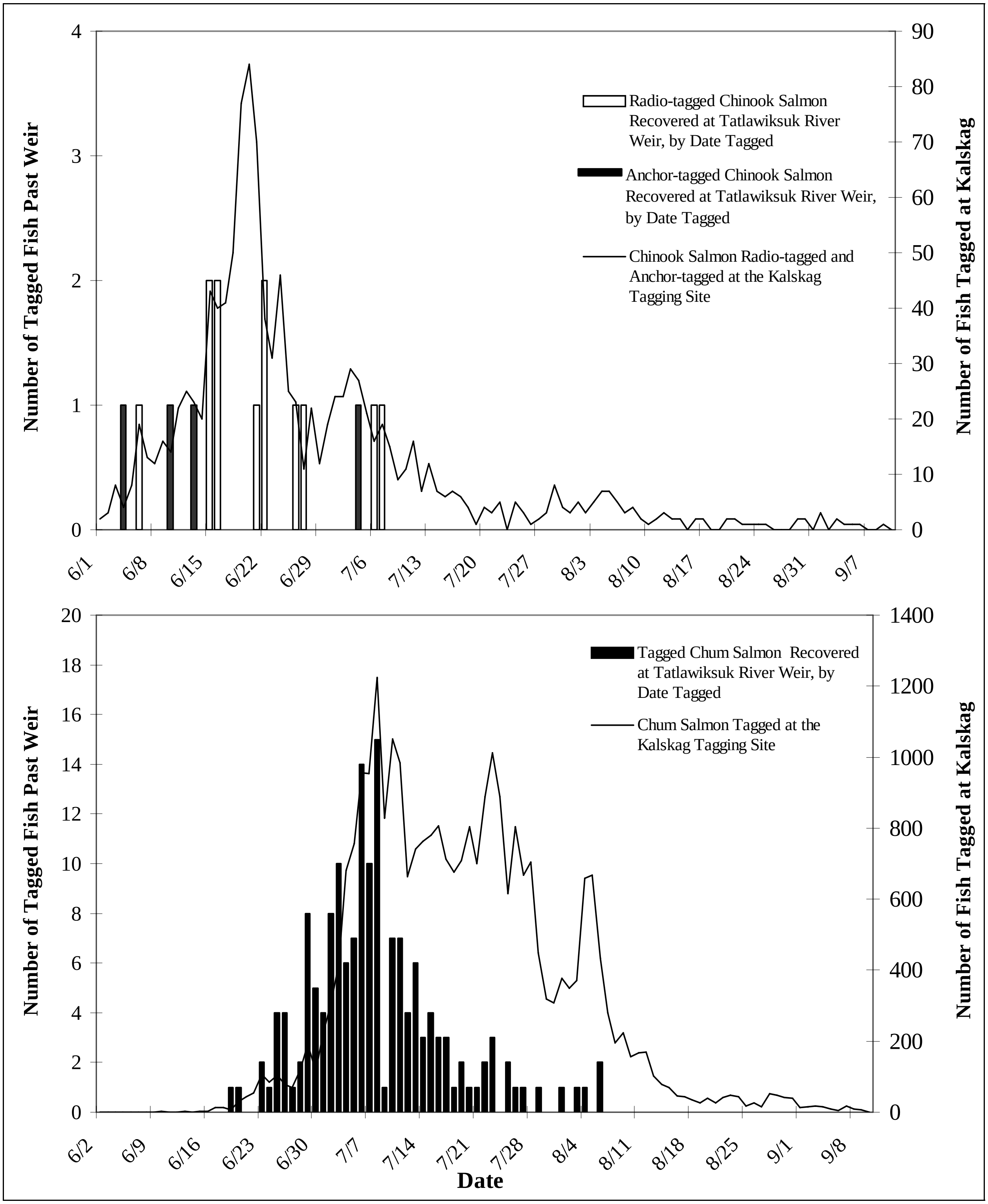
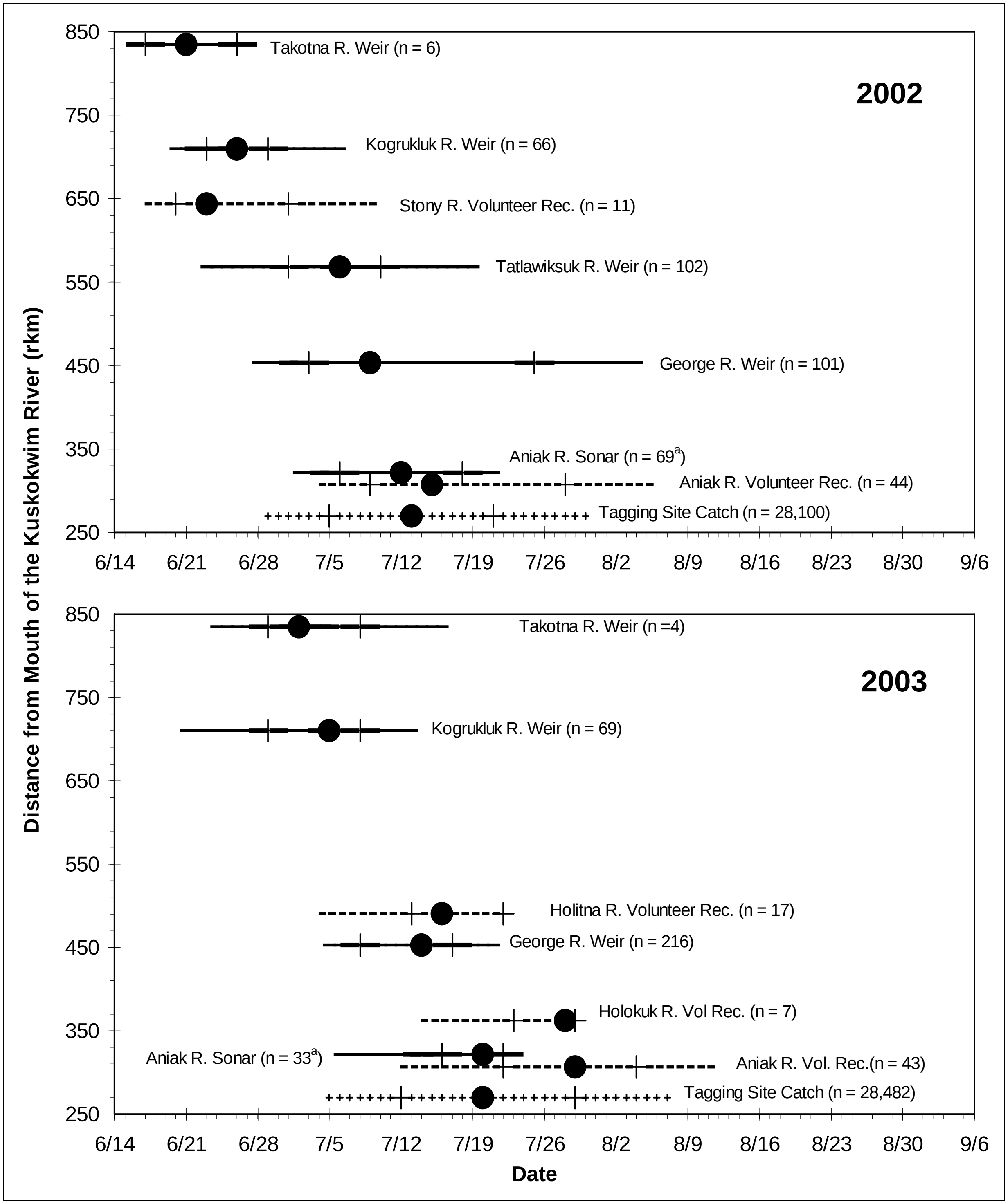


Figure 29.–Chinook and chum salmon captured at the Kalskag tagging site, by date, compared to Chinook and chum salmon recovered at the Tatlawiksuk River weir, by date tagged, 2005.

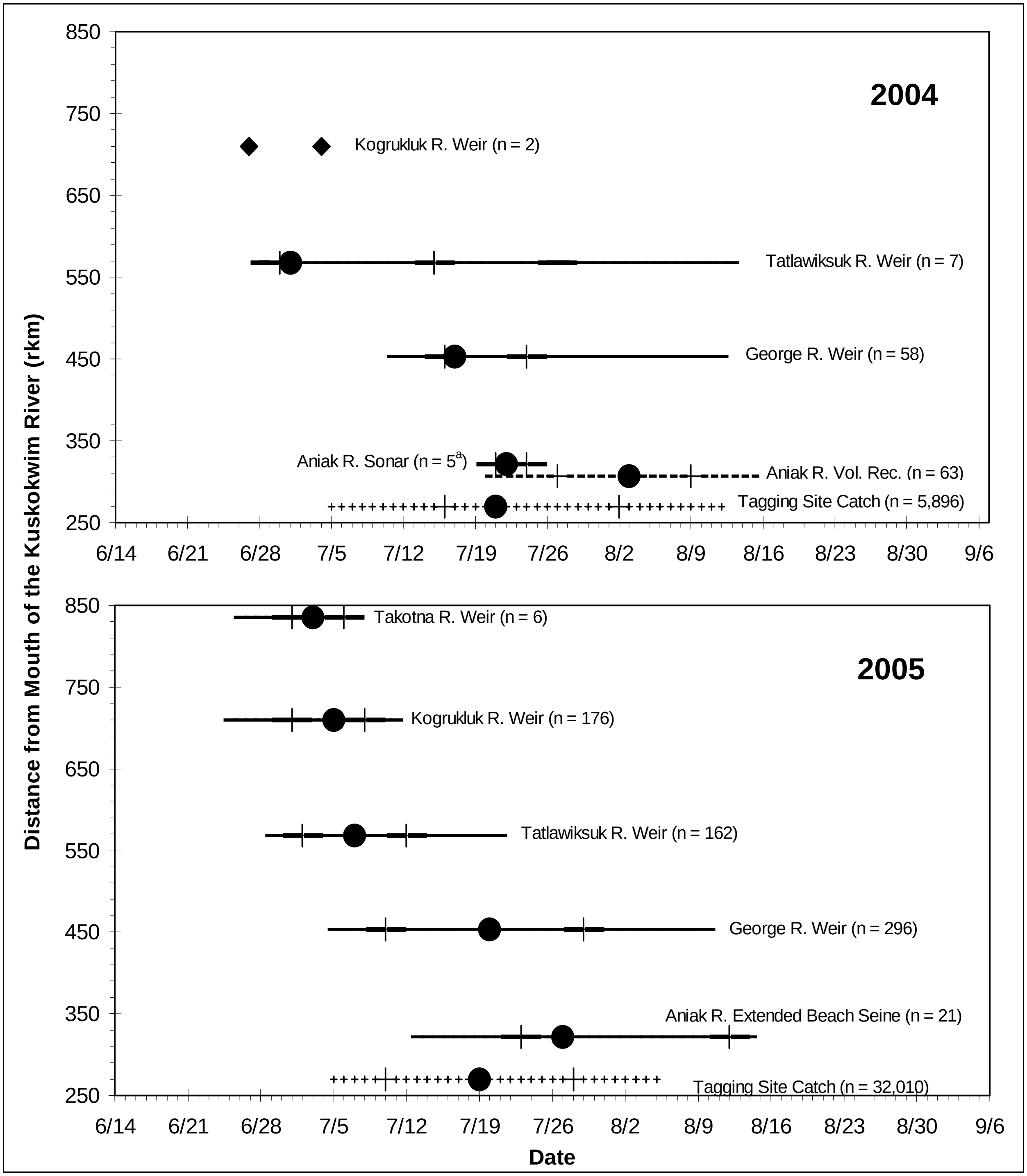


Source: Pawluk et al. *In prep* b.

Note: Horizontal lines represent the central 80%, cross-bars represent the central 50%, and circles represent the median passage date for each stock.

[a] Aniak River sonar is biased early. Aniak River volunteer recovery probably more truly represents run timing.

Figure 30.–Dates when individual chum salmon stocks passed through the Kalskag tagging sites (rkm 271) based on a tagging study, 2002–2003.

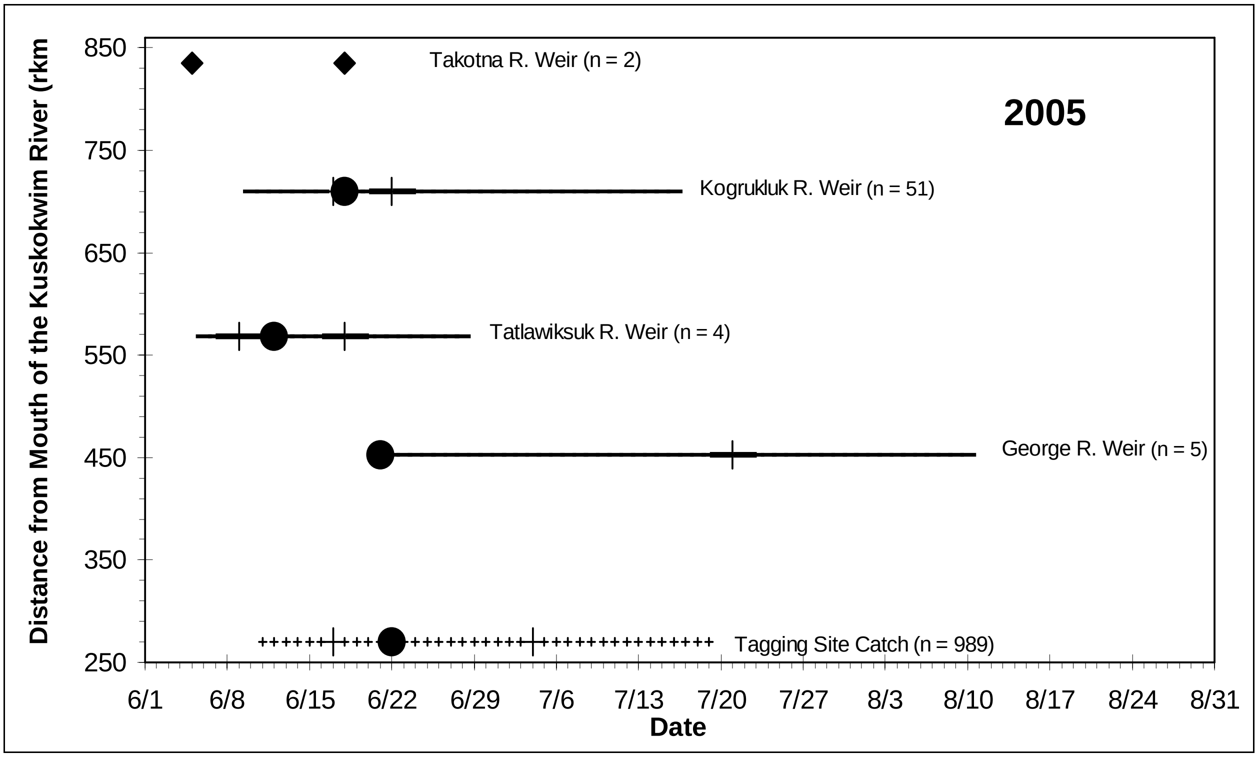


Source: Pawluk et al. *In prep* b.

Note: Horizontal lines represent the central 80%, cross-bars represent the central 50%, and circles represent the median passage date for each stock.

[a] Aniak River sonar is biased early. Aniak River volunteer recovery probably more truly represents run timing.

Figure 31.–Dates when individual chum salmon stocks passed through the Kalskag tagging sites (rkm 271) based on a tagging study, 2004–2005.



Source: Pawluk et al. *In prep* b.

Note: Horizontal lines represent the central 80%, cross-bars represent the central 50%, and circles represent the median passage date for each stock.

Figure 32.–Dates when individual Chinook salmon stocks passed through the Kalskag tagging sites (rkm 271) based on a tagging study, 2005.

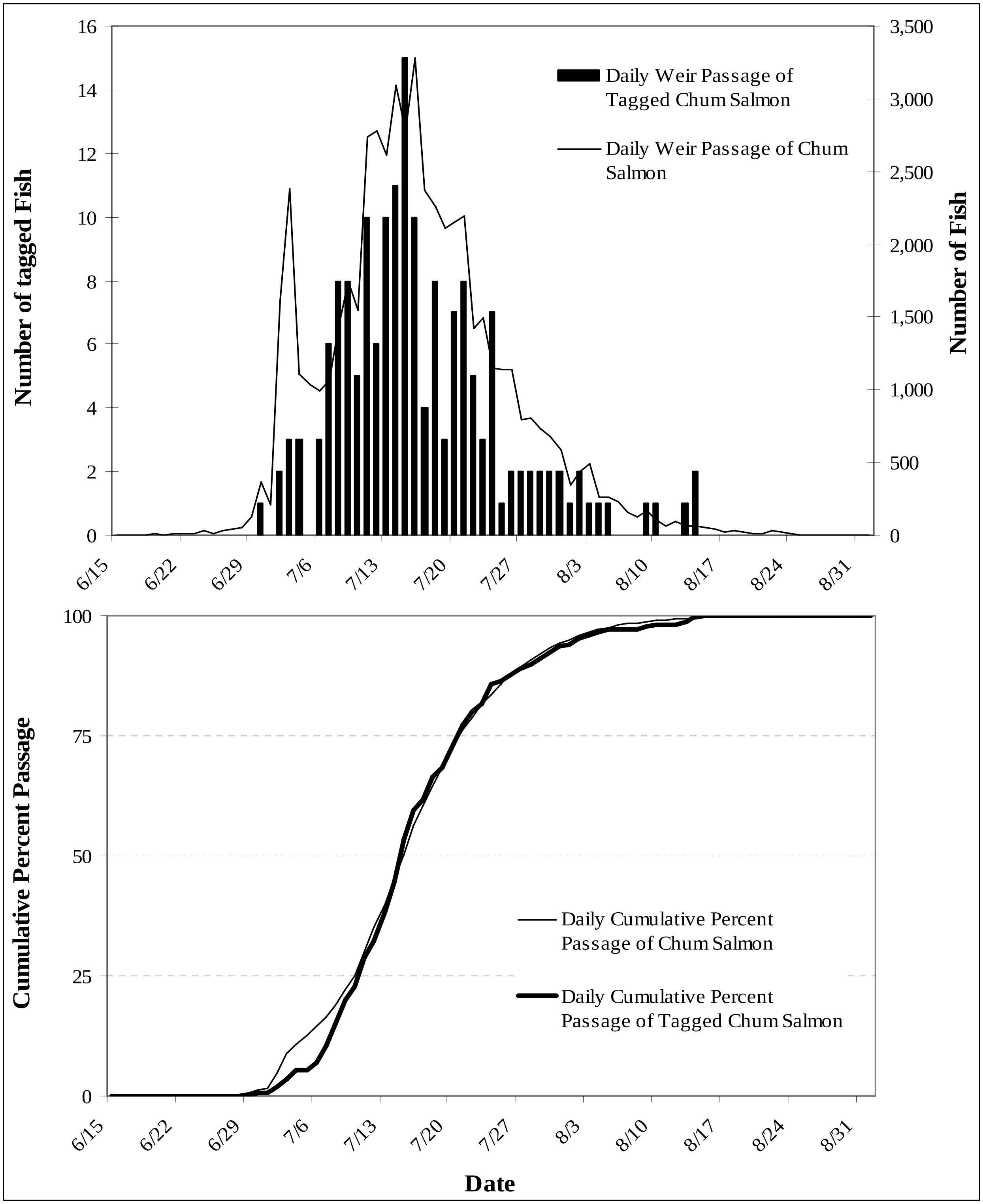


Figure 33.–Daily and cumulative percent passage of overall chum salmon passage compared to tagged chum salmon passage at the Tatlawiksuk River weir in 2005.

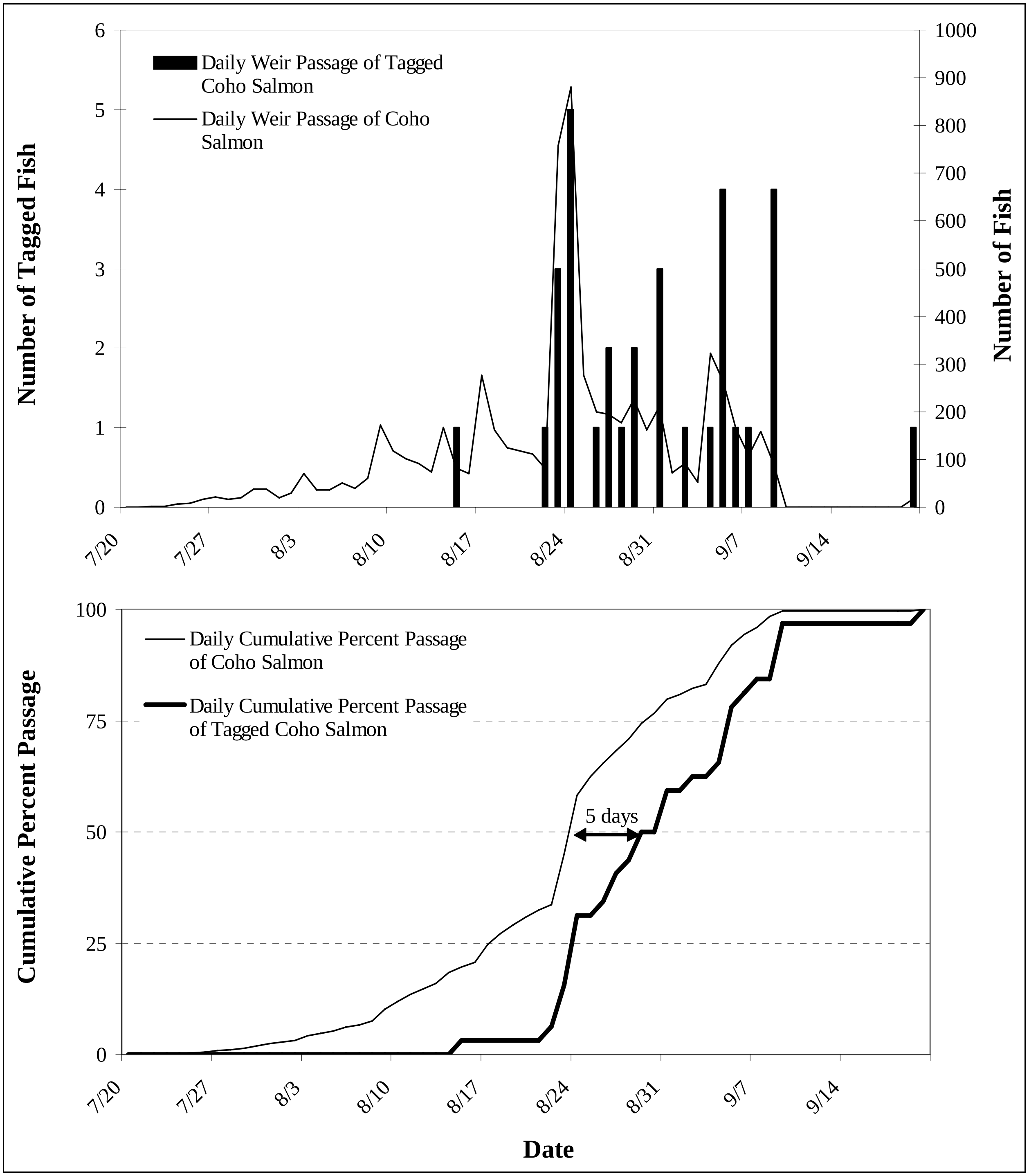
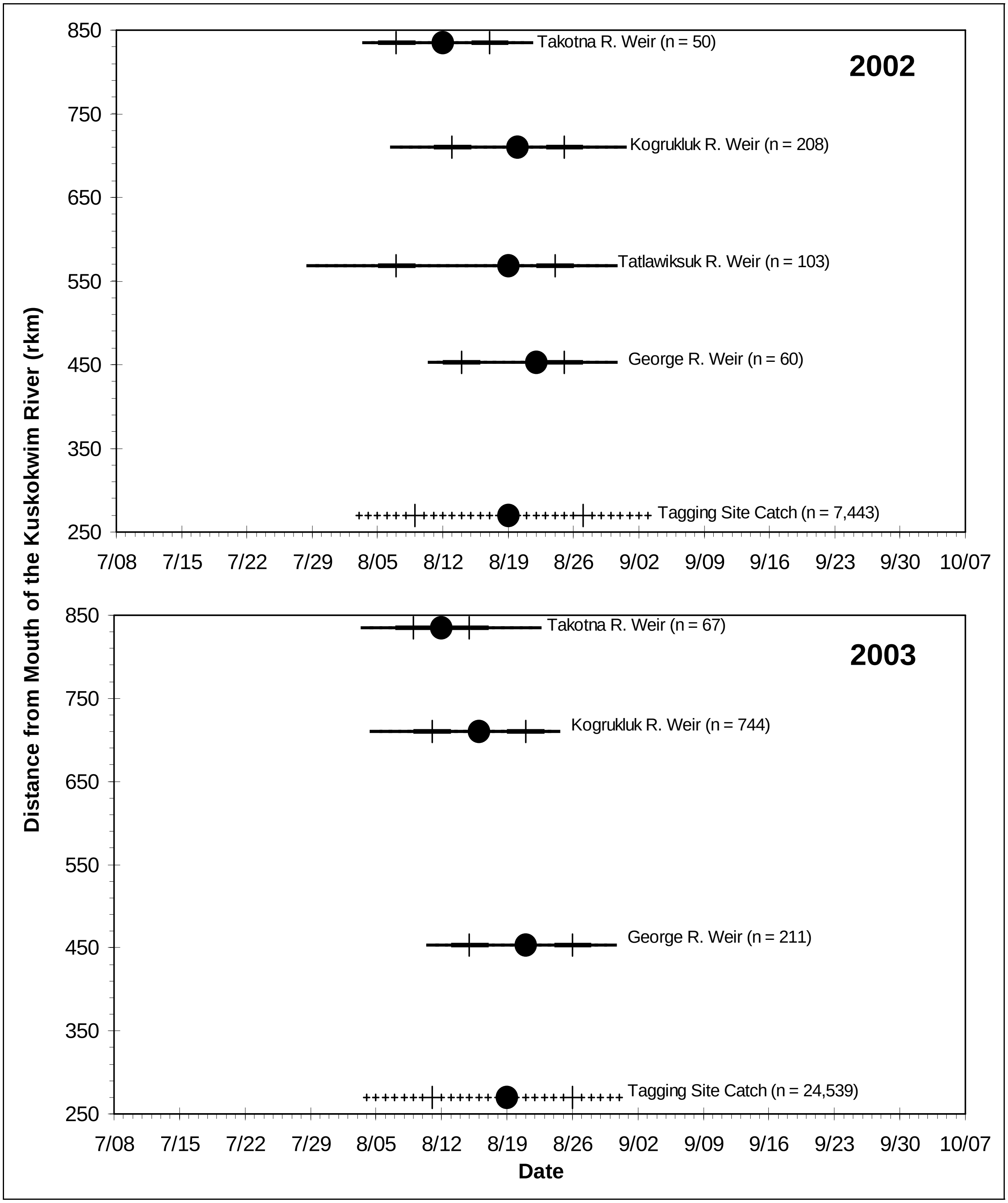


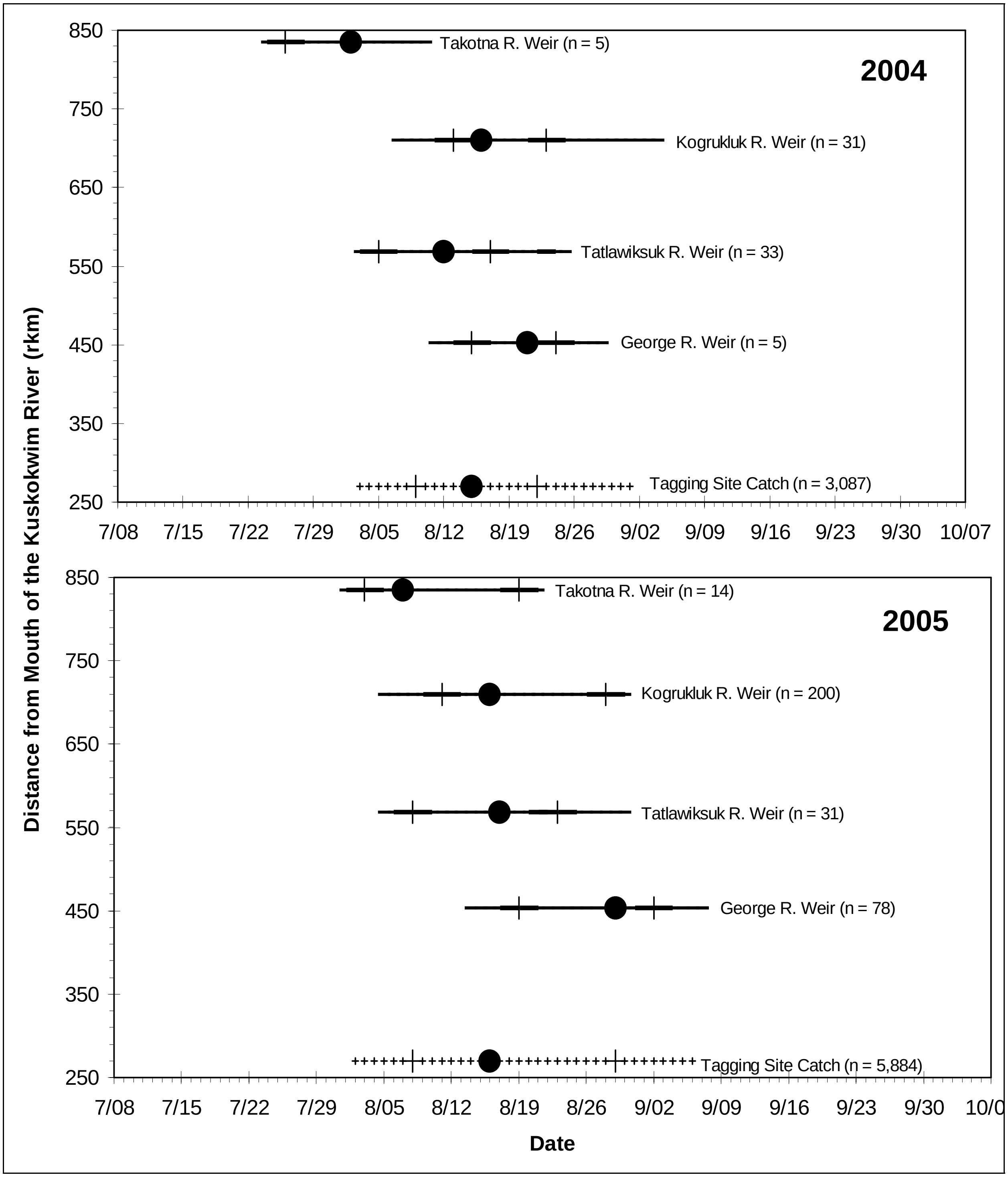
Figure 34.–Daily and cumulative percent passage of overall coho salmon passage compared to tagged coho salmon passage at the Tatlawiksuk River weir in 2005.



Source: Pawluk et al. *In prep* b.

Note: Horizontal lines represent the central 80%, cross-bars represent the central 50%, and circles represent the median passage date for each stock.

Figure 35.–Dates when individual coho salmon stocks passed through the Kalskag tagging sites (rkm 271) based on a tagging study, 2002–2003.



Source: Pawluk et al. *In prep* b.

Note: Horizontal lines represent the central 80%, cross-bars represent the central 50%, and circles represent the median passage date for each stock.

Figure 36.–Dates when individual coho salmon stocks passed through the Kalskag tagging sites (rkm 271) based on a tagging study, 2004–2005.

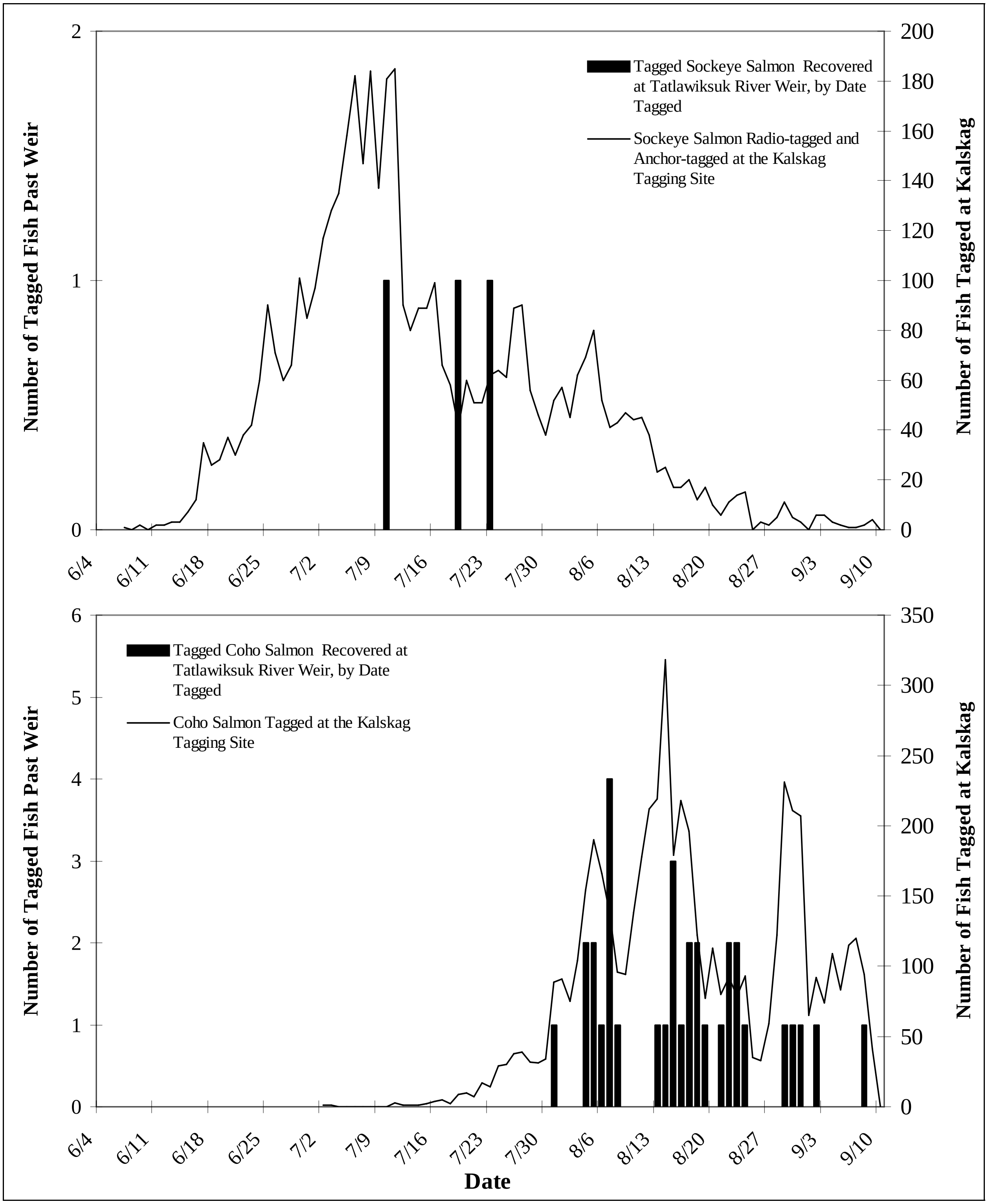


Figure 37.–Sockeye and coho salmon captured at the Kalskag tagging site, by date, compared to Sockeye and coho salmon recovered at the Tatlawiksuk River weir, by date tagged, 2005.

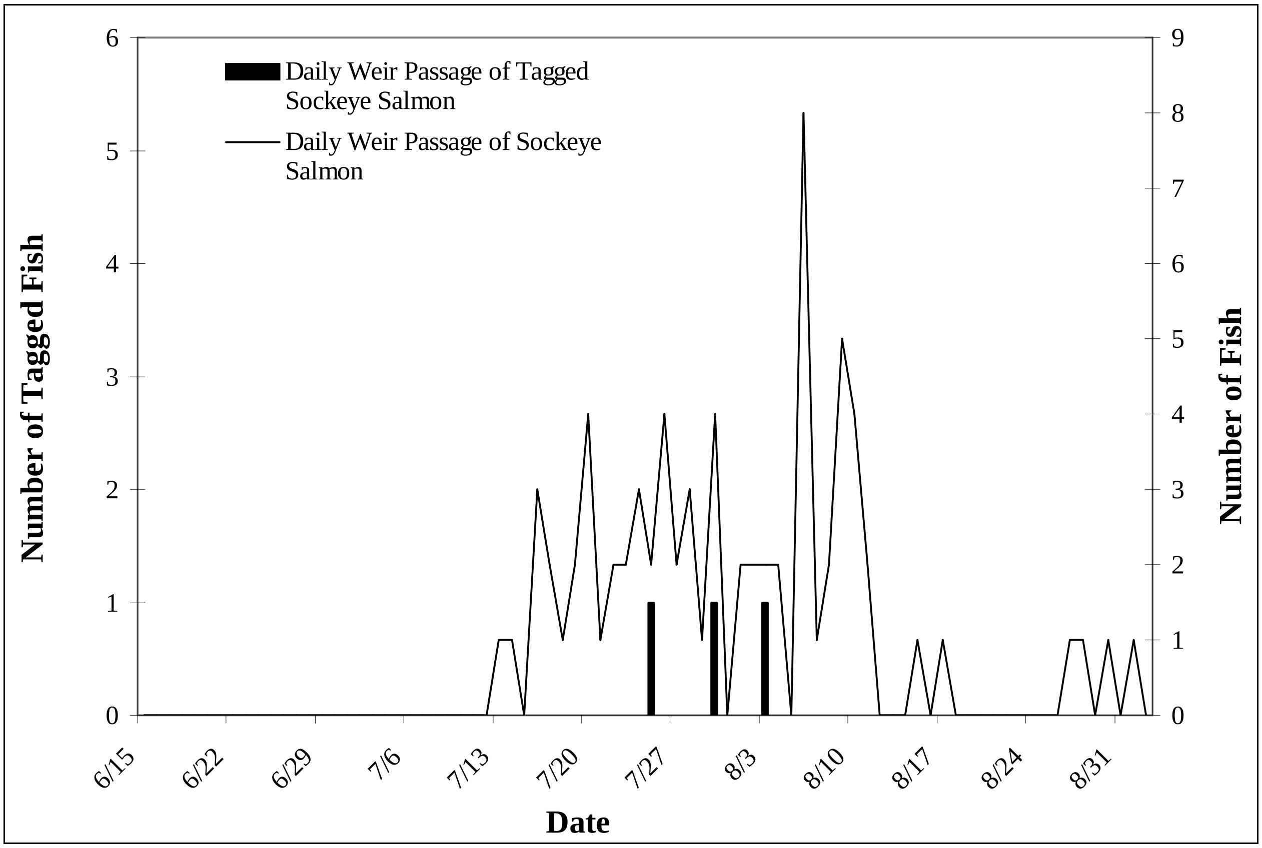
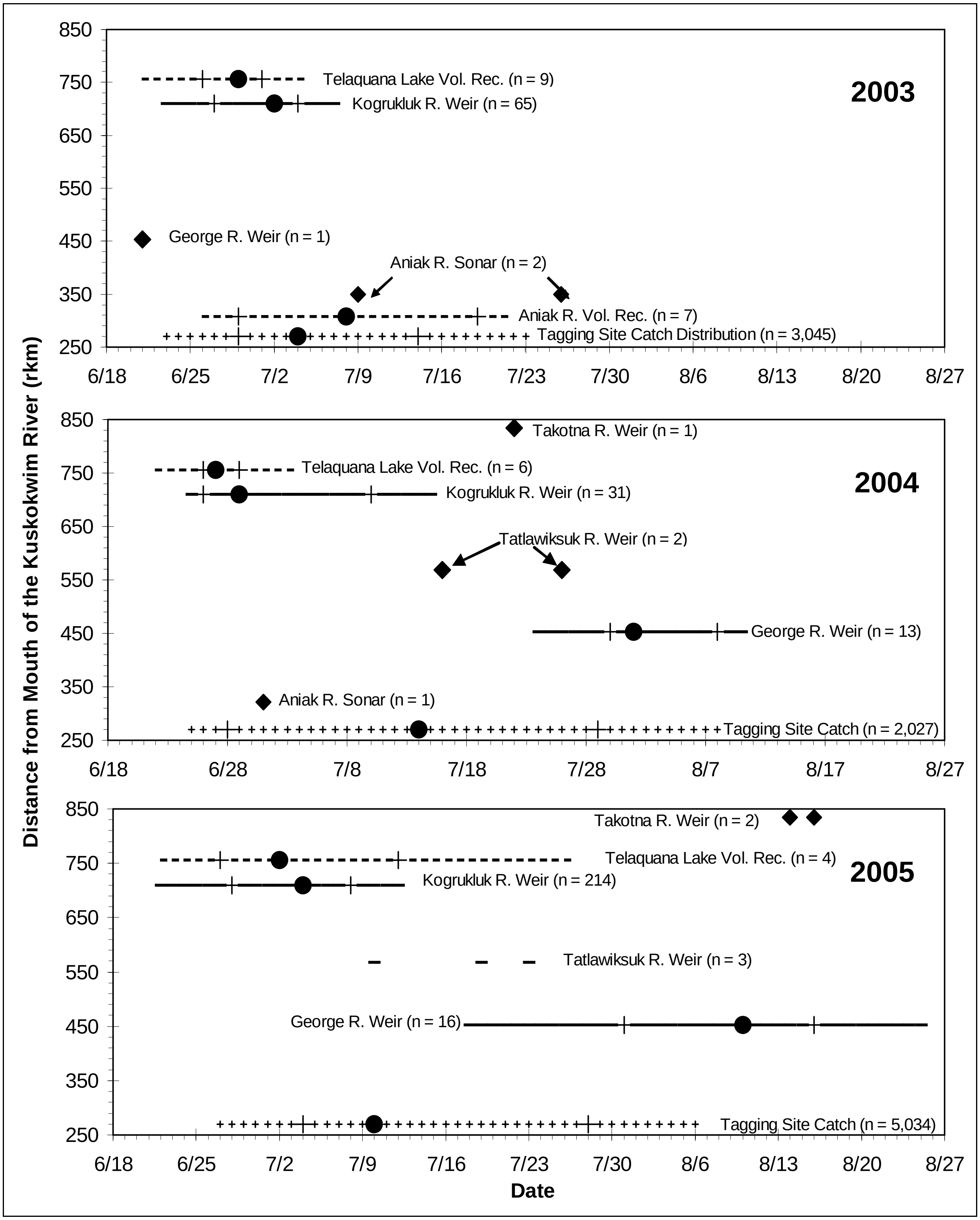


Figure 38.–Daily overall sockeye salmon passage compared to tagged sockeye salmon passage at the Tatlawiksuk River weir in 2005.



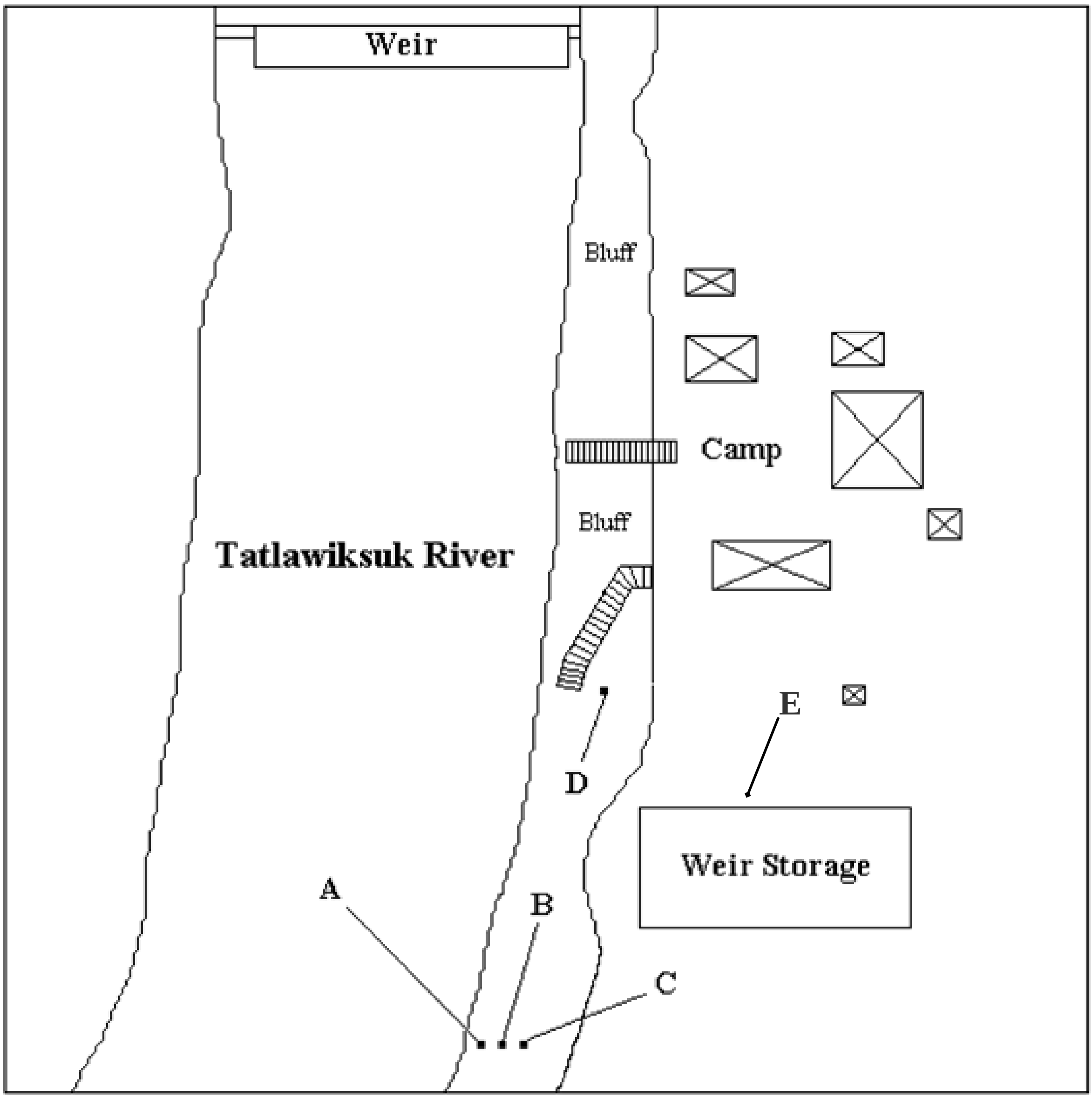
Source: Pawluk et al. *In prep* b.

Note: Horizontal lines represent the central 80%, cross-bars represent the central 50%, and circles represent the median passage date for each stock.

Figure 39.–Dates when individual sockeye salmon stocks passed through the Kalskag tagging sites (rkm 271) based on a tagging study, 2003–2005.

APPENDIX A. STREAM HEIGHT BENCHMARK

Appendix A1.–Locations and descriptions of stream height benchmarks at Tatlawiksuk River weir.



Descriptions:

A: Benchmark 1 – Set in 1999 and represented a stream height of 70 cm. This benchmark was washed out in September of 2000.

B: Benchmark 2 – Set in 1999 and represented a stream height of 115 cm. This benchmark was washed out in September of 2000.

C: Benchmark 3 – Set in 1999 and represents a stream height of 170 cm. This benchmark was in place as of 2005. It consists of two 4-ft long sections of ¾-in aluminum pipe, driven into the bank, one vertically and one horizontally, with the top few inches exposed.

D: Benchmark 4 – Set in 2001 and represents a stream height of 204 cm. This benchmark was not found in 2004.

E: Benchmark 5 – Set in 2005 and represents a stream height of 300 cm. This benchmark consists of a can lid nailed to the flat surface of a sawed-off stump. The can lid is inscribed with "BM 300 cm," and is located near the weir panel rack, on the upstream side.

Appendix A2.–Locations and descriptions of stream height benchmarks at Tatlawiksuk River weir.

APPENDIX B. HISTORICAL SALMON PASSAGE AT THE TATLAWIKSUK RIVER WEIR

Appendix B1.–Historical daily and daily cumulative Chinook salmon passage at the Tatlawiksuk River weir.

	Daily Passage								Cumulative Passage							
Date	**1998**	**1999**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**1998**	**1999**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**
6/12[a]								1								
6/13[a]								1								
6/14[a]								0								
6/15	0 [b]	0	0	0 [b]	0 [b]	0 [b]	2	0	0	0	0	0	0	0	2	0
6/16	0 [b]	0	0	0 [b]	0 [b]	0 [b]	2	0	0	0	0	0	0	0	4	0
6/17	0 [b]	0	0	0 [b]	0 [c]	0 [b]	0	0	0	0	0	0	0	0	4	0
6/18	0	0	2	0 [b]	0	0 [b]	4	1	0	0	2	0	0	0	8	1
6/19	0	0	2	0 [b]	0	0 [b]	8	1	0	0	4	0	0	0	16	2
6/20	1	0	0	0	0	0	3	1	1	0	4	0	0	0	19	3
6/21	0	0	0	1	1	0	2	6	1	0	4	1	1	0	21	9
6/22	0	0	1	2	19	6	1	7	1	0	5	3	20	6	22	16
6/23	8	4	0	1	67	0	0	3	9	4	5	4	87	6	22	19
6/24	12	2	10	3	3	5	11	6	21	6	15	7	90	11	33	25
6/25	7	2	0	5	2	13	74	5	28	8	15	12	92	24	107	30
6/26	12	6	20	71	8	19	241	27	40	14	35	83	100	43	348	57
6/27	37	4	2	18	517	3	21	10	77	18	37	101	617	46	369	67
6/28	31	14	5	38	21	152	84	5	108	32	42	139	638	198	453	72
6/29	23	5	2	15	195	297	75	5	131	37	44	154	833	495	528	77
6/30	5	2	22	105	25	57	43	192	136	39	66	259	858	552	571	269
7/01	99	16	26	364	15	41	315	24	235	55	92	623	873	593	886	293
7/02	182	5	149	24	84	8	131	74	417	60	241	647	957	601	1,017	367
7/03	171	13	47	27	108	96 [b]	86	481	588	73	288	674	1,065	697	1,103	848
7/04	224	26	30	13	135	29 [b]	165	248	812	99	318	687	1,200	726	1,268	1,096
7/05	74	14	42	111	338	59 [b]	243	239 [c]	886	113	360	798	1,538	786	1,511	1,335
7/06	62	15	17	428	64	42 [b]	7	87	948	128	377	1,226	1,602	827	1,518	1,422
7/07	22 [d]	14	18	170	145	13 [b]	84	140	970	142	395	1,396	1,747	841	1,602	1,562
7/08	[e]	13	13	21	10	27 [b]	106	98		155	408	1,417	1,757	868	1,708	1,660
7/09	[e]	21	73	29	24	129 [b]	229	112		176	481	1,446	1,781	997	1,937	1,772
7/10	[e]	40	51	29	27	35 [b]	165	95		216	532	1,475	1,808	1,033	2,102	1,867
7/11	[e]	79 [c]	45	14	48	35 [b]	43	143		295	577	1,489	1,856	1,068	2,145	2,010
7/12	[e]	118	50	48	19	34 [b]	16	101		413	627	1,537	1,875	1,102	2,161	2,111
7/13	[e]	54	9	150	20	88 [b]	98	86		467	636	1,687	1,895	1,190	2,259	2,197
7/14	[e]	64	0	48	21	65 [b]	29	123		531	636	1,735	1,916	1,255	2,288	2,320
7/15	[e]	24	8	47	103	38 [b]	31	35		555	644	1,782	2,019	1,293	2,319	2,355
7/16	[e]	65	20	12	10	28 [b]	47	96		620	664	1,794	2,029	1,321	2,366	2,451

-continued-

Appendix B1.–Page 2 of 3.

Date	Daily Passage 1998	1999	2000	2001	2002	2003	2004	2005	Cumulative Passage 1998	1999	2000	2001	2002	2003	2004	2005
7/17	[e]	6	47	19	15	18 [b]	161	70		626	711	1,813	2,044	1,339	2,527	2,521
7/18	[e]	146	5	31	3	22 [b]	53	65		772	716	1,844	2,047	1,361	2,580	2,586
7/19	[e]	20	8	36	15	30 [b]	17	80		792	724	1,880	2,062	1,390	2,597	2,666
7/20	[e]	381	10	17	8	72 [b]	12	52		1,173	734	1,897	2,070	1,462	2,609	2,718
7/21	[e]	18	2	8	14	9 [b]	22	36		1,191	736	1,905	2,084	1,471	2,631	2,754
7/22	[e]	9	16	21	29	15 [b]	21	24		1,200	752	1,926	2,113	1,486	2,652	2,778
7/23	[e]	86	7	11	13	17 [b]	26	10		1,286	759	1,937	2,126	1,503	2,678	2,788
7/24	[e]	46	5	13 [f]	7	25 [b]	19	15		1,332	764	1,950	2,133	1,528	2,697	2,803
7/25	[e]	33	8	9 [f]	18	16 [b]	13	11		1,365	772	1,959	2,151	1,544	2,710	2,814
7/26	[e]	18	2	6	4	14 [b]	14	11		1,383	774	1,965	2,155	1,558	2,724	2,825
7/27	[e]	14 [f]	3	5 [f]	24	14 [b]	26	5		1,397	777	1,970	2,179	1,572	2,750	2,830
7/28	[e]	10	1	2	20	16 [b]	19	12		1,407	778	1,972	2,199	1,588	2,769	2,842
7/29	[e]	22	1	8	10	13 [b]	9	14		1,429	779	1,980	2,209	1,602	2,778	2,856
7/30	[e]	15	6	3	5	8 [b]	2	12		1,444	785	1,983	2,214	1,610	2,780	2,868
7/31	[e]	6	1	5 [e]	6	16 [b]	15	8		1,450	786	1,988	2,220	1,627	2,795	2,876
8/01	[e]	6	2	4 [b]	1	6 [b]	0	3		1,456	788	1,992	2,221	1,632	2,795	2,879
8/02	[e]	1	3 [b]	3 [b]	5	8 [b]	1	7		1,457	791	1,995	2,226	1,640	2,796	2,886
8/03	[e]	4	8	2 [e]	0	6 [b]	2	5		1,461	799	1,997	2,226	1,646	2,798	2,891
8/04	[e]	3	2	2	1	2 [b]	4	0		1,464	801	1,999	2,227	1,648	2,802	2,891
8/05	[e]	5	0	1	0	2 [b]	6	7		1,469	801	2,000	2,227	1,650	2,808	2,898
8/06	[e]	3	1	1	0	4 [b]	5	2		1,472	802	2,001	2,227	1,653	2,813	2,900
8/07	[e]	2	1	2	1	2 [b]	3	3 [f]		1,474	803	2,003	2,228	1,656	2,816	2,903
8/08	[e]	4	3	2	0	2 [b]	4	2		1,478	806	2,005	2,228	1,658	2,820	2,905
8/09	[e]	0	1	0	1	2 [b]	0	0		1,478	807	2,005	2,229	1,660	2,820	2,905
8/10	[e]	1 [b]	1	1	0	2 [b]	2	0		1,479	808	2,006	2,229	1,661	2,822	2,905
8/11	[e]	1 [b]	1	0	0	1 [b]	3	0		1,480	809	2,006	2,229	1,662	2,825	2,905
8/12	[e]	1 [b]	0	2	1	3 [b]	0	0		1,481	809	2,008	2,230	1,665	2,825	2,905
8/13	[e]	1 [b]	1	1	0	3 [b]	1	1		1,482	810	2,009	2,230	1,668	2,826	2,906
8/14	[e]	1 [b]	2 [d]	0	0	2 [b]	0	1		1,483	812	2,009	2,230	1,670	2,826	2,907
8/15	[e]	1 [b]	1 [b]	0	2	1 [b]	0	2		1,484	814	2,009	2,232	1,671	2,826	2,909
8/16	[e]	1 [b]	1 [b]	0	0	1 [b]	1	1		1,485	814	2,009	2,232	1,673	2,827	2,910
8/17	[e]	1 [b]	0 [b]	0 [b]	0	1 [b]	0	0		1,486	814	2,009	2,232	1,674	2,827	2,910
8/18	[e]	1 [b]	0 [b]	0 [b]	0	1 [b]	0	1		1,487	815	2,009	2,232	1,675	2,827	2,911
8/19	[e]	1 [b]	1 [b]	0 [b]	1	1 [b]	0	0		1,488	815	2,009	2,233	1,676	2,827	2,911
8/20	[e]	0 [b]	0 [b]	0 [b]	0	2 [b]	0	1		1,488	815	2,009	2,233	1,678	2,827	2,912

-continued-

Appendix B1.–Page 3 of 3.

	Daily Passage								Cumulative Passage							
Date	**1998**	**1999**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**1998**	**1999**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**
8/21	[e]	0 [b]	0 [b]	0 [b]	1	1 [b]	3	0		1,488	815	2,009	2,234	1,679	2,830	2,912
8/23	[e]	0 [b]	1 [b]	0 [b]	0	1 [b]	1	0		1,488	816	2,009	2,234	1,680	2,831	2,914
8/24	[e]	0	0 [b]	0 [b]	0	1 [b]	0	1		1,488	816	2,009	2,234	1,681	2,831	2,915
8/25	[e]	1	0 [b]	0 [b]	0	0 [b]	0	1		1,489	816	2,009	2,234	1,681	2,831	2,916
8/26	[e]	0 [f]	1 [b]	0 [b]	0	0 [b]	0	1		1,489	817	2,009	2,234	1,682	2,831	2,917
8/27	[e]	0	0 [b]	1 [c]	0	0 [b]	0	1		1,489	817	2,010	2,234	1,682	2,831	2,918
8/28	[e]	0	0 [b]	0	0	0 [b]	0	0		1,489	817	2,010	2,234	1,682	2,831	2,918
8/29	[e]	0	0 [b]	0	0	0 [b]	1	0		1,489	817	2,010	2,234	1,682	2,832	2,918
8/30	[e]	0	0 [b]	0	0	0 [b]	0	0		1,489	817	2,010	2,234	1,682	2,832	2,918
8/31	[e]	0	0 [b]	0	0	0 [b]	0	0		1,489	817	2,010	2,234	1,682	2,832	2,918
9/01	[e]	0	0 [b]	0	0	0 [b]	0	0		1,489	817	2,010	2,234	1,682	2,832	2,918
9/02	[e]	1	0 [b]	0	0	0 [b]	1	0		1,490	817	2,010	2,234	1,682	2,833	2,918
9/03	[e]	0	0 [b]	0	1	0 [b]	0	0		1,490	817	2,010	2,235	1,682	2,833	2,918
9/04	[e]	0	0 [b]	0	0	0 [b]	0	0		1,490	817	2,010	2,235	1,683	2,833	2,918
9/05	[e]	0	0 [b]	0	0	0 [b]	0	0		1,490	817	2,010	2,235	1,683	2,833	2,918
9/06	[e]	0	0 [b]	0	0	0 [b]	0	0		1,490	817	2,010	2,235	1,683	2,833	2,918
9/07	[e]	0	0 [b]	0	1	0 [b]	0	0		1,490	817	2,010	2,236	1,683	2,833	2,918
9/08	[e]	0	0 [b]	0	0	0 [b]	0	0		1,490	817	2,010	2,236	1,683	2,833	2,918
9/09	[e]	0	0 [b]	0	1	0 [b]	0	0		1,490	817	2,010	2,237	1,683	2,833	2,918
9/10	[e]	0	0 [b]	0	0	0 [b]	0	0 [b]		1,490	817	2,010	2,237	1,683	2,833	2,918
9/11	[e]	0	0 [b]	0	0	0 [b]	0	0 [b]		1,490	817	2,010	2,237	1,683	2,833	2,918
9/12	[e]	0	0 [b]	0	0 [c]	0 [b]	0	0 [b]		1,490	817	2,010	2,237	1,683	2,833	2,918
9/13	[e]	0	0 [b]	0	0 [b]	0 [b]	0	0 [b]		1,490	817	2,010	2,237	1,683	2,833	2,918
9/14	[e]	0	0 [b]	0	0 [b]	0 [b]	0	0 [b]		1,490	817	2,010	2,237	1,683	2,833	2,918
9/15	[e]	0	0 [b]	0	0 [b]	0 [b]	0	0 [b]		1,490	817	2,010	2,237	1,683	2,833	2,918
9/16	[e]	0	0 [b]	0 [b]	0 [b]	0 [b]	0	0 [b]		1,490	817	2,010	2,237	1,683	2,833	2,918
9/17	[e]	0	0 [b]	0 [b]	0 [b]	0 [b]	0	0 [b]		1,490	817	2,010	2,237	1,683	2,833	2,918
9/18	[e]	0	0 [b]	0 [b]	0 [b]	0 [b]	0	0 [b]		1,490	817	2,010	2,237	1,683	2,833	2,918
9/19	[e]	0	0 [b]	0 [b]	0 [b]	0 [b]	[e]	0 [b]		1,490	817	2,010	2,237	1,683	2,833	2,918
9/20	[e]	0	0 [b]	0 [b]	0 [c]	0 [b]	[e]	0		1,490	817	2,010	2,237	1,683	2,833	2,918

[a] Date outside of target operational period (not included in accumulative totals).

[b] The weir was not operational; daily passage was estimated.

[c] Partial day count; passage was estimated.

[d] Partial day count; passage was not estimated.

[e] The weir was not operational; daily passage was not estimated.

[f] Daily passage was estimated due to the occurrence of a hole in the weir.

Appendix B2.–Historical daily and daily cumulative chum salmon passage at the Tatlawiksuk River weir.

	Daily Passage								Cumulative Passage							
Date	1998	1999	2000	2001	2002	2003	2004	2005	1998	1999	2000	2001	2002	2003	2004	2005
6/12[a]								0								
6/13[a]								0								
6/14[a]								0								
6/15	0 [b]	0	1	0 [b]	1 [b]	[d]	9	0	0	0	1	0	1		9	0
6/16	0 [b]	0	1	0 [b]	2 [b]	[d]	15	3	0	0	2	0	3		24	3
6/17	0 [b]	0	0	0 [b]	4 [c]	[d]	7	0	0	0	2	0	7		31	3
6/18	0	0	2	0 [b]	2	[d]	22	2	0	0	4	0	9		53	5
6/19	0	0	0	0 [b]	6	[d]	75	10	0	0	4	0	15		128	15
6/20	0	0	0	0	3	0	105	4	0	0	4	0	18	0	233	19
6/21	5	0	2	3	42	0	53	9	5	0	6	3	60	0	286	28
6/22	4	0	7	4	168	1	81	13	9	0	13	7	228	1	367	41
6/23	12	0	1	30	262	5	71	7	21	0	14	37	490	6	438	48
6/24	25	18	18	22	28	6	169	32	46	18	32	59	518	12	607	80
6/25	26	7	30	61	103	4	594	15	72	25	62	120	621	16	1,201	95
6/26	65	18	97	131	483	12	450	36	137	43	159	251	1,104	28	1,651	131
6/27	197	25	7	69	392	20	175	43	334	68	166	320	1,496	48	1,826	174
6/28	275	67	10	143	574	106	176	56	609	135	176	463	2,070	154	2,002	230
6/29	195	67	3	133	834	71	266	130	804	202	179	596	2,904	225	2,268	360
6/30	146	58	88	368	634	135	378	366	950	260	267	964	3,538	360	2,646	726
7/01	464	91	176	440	424	78	462	213	1,414	351	443	1,404	3,962	438	3,108	939
7/02	529	86	492	143	1,037	41	690	1,605	1,943	437	935	1,547	4,999	479	3,798	2,544
7/03	556	101	280	171	501	[d]	660	2,380	2,499	538	1,215	1,718	5,500		4,458	4,924
7/04	1,005	110	147	162	759	[d]	525	1,110	3,504	648	1,362	1,880	6,259		4,983	6,034
7/05	1,011	94	325	488	1,278	[d]	482	1,387 [e]	4,515	742	1,687	2,368	7,537		5,465	7,421
7/06	757	141	155	618	1,762	[d]	235	993	5,272	883	1,842	2,986	9,299		5,700	8,414
7/07	454 [f]	171	175	778	809	[d]	638	1,063	5,726	1,054	2,017	3,764	10,108		6,338	9,477
7/08	[d]	158	109	900	666	[d]	811	1,439		1,212	2,126	4,664	10,774		7,149	10,916
7/09	[d]	324	462	1,061	840	[d]	836	1,748		1,536	2,588	5,725	11,614		7,985	12,664
7/10	[d]	391	247	1,399	828	[d]	627	1,546		1,927	2,835	7,124	12,442		8,612	14,210
7/11	[d]	404 [e]	391	596	1,238	[d]	425	2,741		2,331	3,226	7,720	13,680		9,037	16,951
7/12	[d]	416	611	1,179	869	[d]	502	2,775		2,747	3,837	8,899	14,549		9,539	19,726
7/13	[d]	280	169	1,199	702	[d]	967	2,610		3,027	4,006	10,098	15,251		10,506	22,336
7/14	[d]	361	33	1,301	707	[d]	759	3,095		3,388	4,039	11,399	15,958		11,265	25,431
7/15	[d]	268	266	1,330	1,123	[d]	642	2,780		3,656	4,305	12,729	17,081		11,907	28,211
7/16	[d]	377	367	1,092	677	[d]	829	3,283		4,033	4,672	13,821	17,758		12,736	31,494

-continued-

Appendix B2.–Page 2 of 3.

	Daily Passage								Cumulative Passage							
Date	1998	1999	2000	2001	2002	2003	2004	2005	1998	1999	2000	2001	2002	2003	2004	2005
7/17	[d]	339	257	1,201	959	[d]	863	2,370		4,372	4,929	15,022	18,717		13,599	33,864
7/18	[d]	404	183	1,607	880	[d]	800	2,260		4,776	5,112	16,629	19,597		14,399	36,124
7/19	[d]	160	144	859	707	[d]	655	2,115		4,936	5,256	17,488	20,304		15,054	38,239
7/20	[d]	663	88	699	468	[d]	573	2,156		5,599	5,344	18,187	20,772		15,627	40,395
7/21	[d]	306	176	761	504	[d]	557	2,196		5,905	5,520	18,948	21,276		16,184	42,591
7/22	[d]	275	238	650	515	[d]	495	1,422		6,180	5,758	19,598	21,791		16,679	44,013
7/23	[d]	628	158	614	409	[d]	513	1,491		6,808	5,916	20,212	22,200		17,192	45,504
7/24	[d]	322	152	511 [c]	251	[d]	463	1,152		7,130	6,068	20,723	22,451		17,655	46,656
7/25	[d]	338	114	391 [c]	206	[d]	474	1,138		7,468	6,182	21,114	22,657		18,129	47,794
7/26	[d]	205	85	270	195	[d]	359	1,144		7,673	6,267	21,384	22,852		18,488	48,938
7/27	[d]	214 [e]	122	206 [c]	301	[d]	421	794		7,886	6,389	21,590	23,153		18,909	49,732
7/28	[d]	222	93	169	224	[d]	344	807		8,108	6,482	21,759	23,377		19,253	50,539
7/29	[d]	130	94	178	159	[d]	304	732		8,238	6,576	21,937	23,536		19,557	51,271
7/30	[d]	285	141	230	144	[d]	123	680		8,523	6,717	22,167	23,680		19,680	51,951
7/31	[d]	141	72	190 [c]	119	[d]	322	587		8,664	6,789	22,357	23,799		20,002	52,538
8/01	[d]	171	41	176 [b]	99	[d]	151	344		8,835	6,830	22,533	23,898		20,153	52,882
8/02	[d]	125	37 [b]	163 [b]	59	[d]	124	440		8,960	6,867	22,696	23,957		20,277	53,322
8/03	[d]	141	18	149 [c]	54	[d]	85	486		9,101	6,885	22,845	24,011		20,362	53,808
8/04	[d]	60	15	131	64	[d]	93	266		9,161	6,900	22,976	24,075		20,455	54,074
8/05	[d]	57	8	139	98	[d]	117	265		9,218	6,908	23,115	24,173		20,572	54,339
8/06	[d]	35	9	96	44	[d]	87	227		9,253	6,917	23,211	24,217		20,659	54,566
8/07	[d]	43	12	95	55	[d]	99	196 [e]		9,296	6,929	23,306	24,272		20,758	54,761
8/08	[d]	24	5	62	72	[d]	134	122		9,320	6,934	23,368	24,344		20,892	54,883
8/09	[d]	42	2	69	30	[d]	43	168		9,362	6,936	23,437	24,374		20,935	55,051
8/10	[d]	30 [b]	5	36	37	[d]	44	105		9,392	6,941	23,473	24,411		20,979	55,156
8/11	[d]	28 [b]	7	38	22	[d]	45	62		9,420	6,948	23,511	24,433		21,024	55,218
8/12	[d]	26 [b]	8	38	25	[d]	26	93		9,446	6,956	23,549	24,458		21,050	55,311
8/13	[d]	24 [b]	9	27	13	[d]	13	63		9,470	6,965	23,576	24,471		21,063	55,374
8/14	[d]	22 [b]	10 [c]	19	5	[d]	22	59		9,492	6,975	23,595	24,476		21,085	55,433
8/15	[d]	20 [b]	4 [b]	23	13	[d]	19	55		9,512	6,979	23,618	24,489		21,104	55,488
8/16	[d]	17 [b]	4 [b]	8	8	[d]	14	44		9,529	6,983	23,626	24,497		21,118	55,532
8/17	[d]	15 [b]	4 [b]	14 [b]	8	[d]	7	16		9,544	6,987	23,640	24,505		21,125	55,548
8/18	[d]	13 [b]	2 [b]	13 [b]	15	[d]	5	28		9,557	6,989	23,653	24,520		21,130	55,576
8/19	[d]	11 [b]	6 [b]	12 [b]	1	[d]	14	19		9,568	6,995	23,665	24,521		21,144	55,595
8/20	[d]	9 [b]	14 [b]	11 [b]	2	[d]	20	6		9,577	7,009	23,675	24,523		21,164	55,601

-continued-

Appendix B2.–Page 3 of 3.

	Daily Passage								Cumulative Passage							
Date	1998	1999	2000	2001	2002	2003	2004	2005	1998	1999	2000	2001	2002	2003	2004	2005
8/21	[d]	7 [b]	8 [b]	9 [b]	1	[d]	9	12		9,584	7,017	23,684	24,524		21,173	55,613
8/22	[d]	4 [b]	0 [b]	8 [b]	2	[d]	12	33		9,588	7,017	23,692	24,526		21,185	55,646
8/23	[d]	1 [b]	2 [b]	7 [b]	0	[d]	9	17		9,589	7,019	23,699	24,526		21,194	55,663
8/24	[d]	1	0 [b]	6 [b]	2	[d]	4	13		9,590	7,019	23,705	24,528		21,198	55,676
8/25	[d]	0	6 [b]	4 [b]	2	[d]	7	1		9,590	7,025	23,709	24,530		21,205	55,677
8/26	[d]	2 [e]	2 [b]	3 [b]	2	[d]	5	5		9,592	7,027	23,712	24,532		21,210	55,682
8/27	[d]	2	2 [b]	2 [c]	0	[d]	4	5		9,594	7,029	23,714	24,532		21,214	55,687
8/28	[d]	0	2 [b]	1	0	[d]	3	5		9,594	7,031	23,715	24,532		21,217	55,692
8/29	[d]	0	2 [b]	0	2	[d]	3	4		9,594	7,033	23,715	24,534		21,220	55,696
8/30	[d]	0	2 [b]	0	1	[d]	0	3		9,594	7,035	23,715	24,535		21,220	55,699
8/31	[d]	1	0 [b]	0	2	[d]	1	2		9,595	7,035	23,715	24,537		21,221	55,701
9/01	[d]	0	4 [b]	0	2	[d]	6	0		9,595	7,039	23,715	24,539		21,227	55,701
9/02	[d]	1	0 [b]	2	1	[d]	0	1		9,596	7,039	23,717	24,540		21,227	55,702
9/03	[d]	0	2 [b]	1	0	[d]	2	1		9,596	7,041	23,718	24,540		21,229	55,703
9/04	[d]	0	0 [b]	0	0	[d]	2	2		9,596	7,041	23,718	24,540		21,231	55,705
9/05	[d]	1	2 [b]	0	1	[d]	1	3		9,597	7,044	23,718	24,541		21,232	55,708
9/06	[d]	2	0 [b]	0	0	[d]	2	1		9,599	7,044	23,718	24,541		21,234	55,709
9/07	[d]	0	0 [b]	0	0	[d]	3	1		9,599	7,044	23,718	24,541		21,237	55,710
9/08	[d]	0	0 [b]	0	0	[d]	0	2		9,599	7,044	23,718	24,541		21,237	55,712
9/09	[d]	0	0 [b]	0	0	[d]	0	0		9,599	7,044	23,718	24,541		21,237	55,712
9/10	[d]	0	0 [b]	0	0	[d]	0	1 [b]		9,599	7,044	23,718	24,541		21,237	55,713
9/11	[d]	0	0 [b]	0	0	[d]	2	1 [b]		9,599	7,044	23,718	24,541		21,239	55,714
9/12	[d]	0	0 [b]	0	1 [c]	[d]	1	1 [b]		9,599	7,044	23,718	24,542		21,240	55,715
9/13	[d]	0	0 [b]	0	0 [b]	[d]	1	1 [b]		9,599	7,044	23,718	24,542		21,241	55,716
9/14	[d]	0	0 [b]	0	0 [b]	[d]	1	1 [b]		9,599	7,044	23,718	24,542		21,242	55,716
9/15	[d]	0	0 [b]	0	0 [b]	[d]	2	1 [b]		9,599	7,044	23,718	24,542		21,244	55,717
9/16	[d]	0	0 [b]	0 [b]	0 [b]	[d]	1	1 [b]		9,599	7,044	23,718	24,542		21,245	55,718
9/17	[d]	0	0 [b]	0 [b]	0 [b]	[d]	0	1 [b]		9,599	7,044	23,718	24,542		21,245	55,718
9/18	[d]	0	0 [b]	0 [b]	0 [b]	[d]	0	1 [b]		9,599	7,044	23,718	24,542		21,245	55,719
9/19	[d]	0	0 [b]	0 [b]	0 [b]	[d]	[d]	1 [b]		9,599	7,044	23,718	24,542			55,720
9/20	[d]	0	0 [b]	0 [b]	0 [c]	[d]	[d]	0		9,599	7,044	23,718	24,542			55,720

[a] Date outside of target operational period (not included in accumulative totals).
[b] The weir was not operational; daily passage was estimated.
[c] Partial day count; passage was estimated.
[d] The weir was not operational; daily passage was not estimated.
[e] Daily passage was estimated due to the occurrence of a hole in the weir.
[f] Partial day count; passage was not estimated.

Appendix B3.–Historical daily and daily cumulative coho salmon passage at the Tatlawiksuk River weir.

	Daily Passage							Cumulative Passage						
Date	**1999**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**1999**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**
6/12[a]							0							
6/13[a]							0							
6/14[a]							0							
6/15	0	0	0 [b]	0 [b]	[c]	0	0	0	0	0	0		0	0
6/16	0	0	0 [b]	0 [b]	[c]	0	0	0	0	0	0		0	0
6/17	0	0	0 [b]	0 [d]	[c]	0	0	0	0	0	0		0	0
6/18	0	0	0 [b]	0	[c]	0	0	0	0	0	0		0	0
6/19	0	0	0 [b]	0	[c]	0	0	0	0	0	0		0	0
6/20	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6/21	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6/22	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6/23	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6/24	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6/25	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6/26	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6/27	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6/28	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6/29	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6/30	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7/01	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7/02	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7/03	0	0	0	0	[c]	0	0	0	0	0	0		0	0
7/04	0	0	0	0	[c]	0	0	0	0	0	0		0	0
7/05	0	0	0	0	[c]	0	0 [e]	0	0	0	0		0	0
7/06	0	0	0	0	[c]	0	0	0	0	0	0		0	0
7/07	0	0	0	0	[c]	0	0	0	0	0	0		0	0
7/08	0	0	0	0	[c]	0	0	0	0	0	0		0	0
7/09	0	0	0	0	[c]	0	0	0	0	0	0		0	0
7/10	0	0	0	0	[c]	0	0	0	0	0	0		0	0
7/11	0 [e]	0	0	0	[c]	0	0	0	0	0	0		0	0
7/12	0	0	0	0	[c]	0	0	0	0	0	0		0	0
7/13	0	0	0	0	[c]	0	0	0	0	0	0		0	0
7/14	0	0	0	0	[c]	0	0	0	0	0	0		0	0
7/15	0	0	0	0	[c]	0	0	0	0	0	0		0	0
7/16	0	0	0	0	[c]	0	0	0	0	0	0		0	0

-continued-

Appendix B3.–Page 2 of 3.

Date	Daily Passage 1999	2000	2001	2002	2003	2004	2005	Cumulative Passage 1999	2000	2001	2002	2003	2004	2005
7/17	0	0	0	0	[c]	0	0	0	0	0	0		0	0
7/18	0	0	0	0	[c]	0	1	0	0	0	0		0	1
7/19	0	2	0	0	[c]	0	0	0	2	0	0		0	1
7/20	0	0	0	0	[c]	1	0	0	2	0	0		1	1
7/21	0	1	0	0	[c]	0	0	0	3	0	0		1	1
7/22	0	0	0	0	[c]	3	2	0	3	0	0		4	3
7/23	0	0	0	0	[c]	6	1	0	3	0	0		10	4
7/24	0	1	0 [e]	0	[c]	7	6	0	4	0	0		17	10
7/25	1	0	0 [e]	0	[c]	3	8	1	4	0	0		20	18
7/26	0	0	0	0	[c]	19	16	1	4	0	0		39	34
7/27	1 [e]	0	0 [e]	3	[c]	31	21	2	4	0	3		70	55
7/28	2	3	1	3	[c]	22	16	4	7	1	6		92	71
7/29	9	2	0	3	[c]	18	19	13	9	1	9		110	90
7/30	1	25	8	8	[c]	15	37	14	34	9	17		125	127
7/31	1	11	18 [e]	3	[c]	106	38	15	45	27	20		231	165
8/01	0	40	29 [b]	5	[c]	55	20	15	85	56	25		286	185
8/02	0	110 [b]	42 [b]	11	[c]	93	29	15	195	98	36		379	214
8/03	0	172	54 [e]	16	[c]	98	70	15	367	152	52		477	284
8/04	0	215	42	4	[c]	128	36	15	582	194	56		605	320
8/05	2	173	91	33	[c]	214	36	17	755	285	89		819	356
8/06	0	129	47	23	[c]	452	51	17	884	332	112		1,271	407
8/07	5	277	74	46	[c]	468	80 [e]	22	1,161	406	158		1,739	487
8/08	1	108	135	43	[c]	437	60	23	1,269	541	201		2,176	547
8/09	1	267	130	79	[c]	497	172	24	1,536	671	280		2,673	719
8/10	3 [b]	619	264	73	[c]	536	118	27	2,155	935	353		3,209	837
8/11	5 [b]	730	212	63	[c]	450	101	32	2,885	1,147	416		3,659	938
8/12	2 [b]	1,123	306	437	[c]	722	91	33	4,008	1,453	853		4,381	1,029
8/13	9 [b]	1,429	314	787	[c]	534	73	42	5,437	1,767	1,640		4,915	1,102
8/14	12 [b]	319 [d]	864	240	[c]	646	167	54	5,756	2,631	1,880		5,561	1,269
8/15	13 [b]	[c]	530	220	[c]	628	82	67		3,161	2,100		6,189	1,351
8/16	27 [b]	[c]	860	345	[c]	515	71	94		4,021	2,445		6,704	1,422
8/17	36 [b]	[c]	652 [b]	53	[c]	575	277	129		4,673	2,498		7,279	1,699
8/18	44 [b]	[c]	610 [b]	349	[c]	591	162	173		5,283	2,847		7,870	1,861
8/19	26 [b]	[c]	567 [b]	27	[c]	716	125	199		5,850	2,874		8,586	1,986
8/20	71 [b]	[c]	525 [b]	28	[c]	395	118	270		6,375	2,902		8,981	2,104

-continued-

Appendix B3.–Page 3 of 3.

	Daily Passage							Cumulative Passage						
Date	1999	2000	2001	2002	2003	2004	2005	1999	2000	2001	2002	2003	2004	2005
8/21	73 [b]	[c]	482 [b]	1,199	[c]	708	111	343		6,856	4,101		9,689	2,215
8/22	32 [b]	[c]	439 [b]	420	[c]	825	80	375		7,296	4,521		10,514	2,295
8/23	71 [b]	[c]	397 [b]	1,347	[c]	679	757	446		7,692	5,868		11,193	3,052
8/24	103	[c]	354 [b]	1,027	[c]	473	881	549		8,046	6,895		11,666	3,933
8/25	88	[c]	311 [b]	542	[c]	638	277	637		8,358	7,437		12,304	4,210
8/26	93 [e]	[c]	269 [b]	750	[c]	266	199	730		8,626	8,187		12,570	4,409
8/27	97	[c]	226 [d]	354	[c]	304	194	827		8,853	8,541		12,874	4,603
8/28	181	[c]	185	345	[c]	259	177	1,008		9,038	8,886		13,133	4,780
8/29	171	[c]	182	106	[c]	246	226	1,179		9,220	8,992		13,379	5,006
8/30	93	[c]	204	52	[c]	238	162	1,272		9,424	9,044		13,617	5,168
8/31	184	[c]	176	368	[c]	284	211	1,456		9,600	9,412		13,901	5,379
9/01	239	[c]	64	409	[c]	507	72	1,695		9,664	9,821		14,408	5,451
9/02	170	[c]	87	225	[c]	260	92	1,865		9,751	10,046		14,668	5,543
9/03	140	[c]	107	92	[c]	281	52	2,005		9,858	10,138		14,949	5,595
9/04	190	[c]	88	182	[c]	183	323	2,195		9,946	10,320		15,132	5,918
9/05	193	[c]	80	201	[c]	88	264	2,388		10,026	10,521		15,220	6,182
9/06	103	[c]	33	79	[c]	137	164	2,491		10,059	10,600		15,357	6,346
9/07	30	[c]	43	253	[c]	117	108	2,521		10,102	10,853		15,474	6,454
9/08	35	[c]	55	40	[c]	134	159	2,556		10,157	10,893		15,608	6,613
9/09	53	[c]	38	62	[c]	119	92	2,609		10,195	10,955		15,727	6,705
9/10	303	[c]	13	54	[c]	123	117 [b]	2,912		10,208	11,009		15,850	6,821
9/11	81	[c]	61	53	[c]	149	108 [b]	2,993		10,269	11,062		15,999	6,929
9/12	81	[c]	29	51 [d]	[c]	95	99 [b]	3,074		10,298	11,113		16,094	7,029
9/13	99	[c]	30	45 [b]	[c]	114	90 [b]	3,173		10,328	11,158		16,208	7,119
9/14	82	[c]	38	40 [b]	[c]	85	82 [b]	3,255		10,366	11,198		16,293	7,201
9/15	51	[c]	56	36 [b]	[c]	68	73 [b]	3,306		10,422	11,234		16,361	7,274
9/16	26	[c]	39 [b]	31 [b]	[c]	19	64 [b]	3,332		10,461	11,265		16,380	7,338
9/17	32	[c]	31 [b]	27 [b]	[c]	23	55 [b]	3,364		10,492	11,292		16,403	7,393
9/18	18	[c]	24 [b]	22 [b]	[c]	7	47 [b]	3,382		10,516	11,314		16,410	7,439
9/19	56	[c]	16 [b]	18 [b]	[c]	0 [b]	38 [b]	3,438		10,531	11,332		16,410	7,477
9/20	17	[c]	8 [b]	13 [d]	[c]	0 [b]	18	3,455		10,539	11,345		16,410	7,495

[a] Date outside of target operational period (not included in accumulative totals).
[b] The weir was not operational; daily passage was estimated.
[c] The weir was not operational; daily passage was not estimated.
[d] Partial day count; passage was estimated.
[e] Daily passage was estimated due to the occurrence of a hole in the weir.

Appendix B4.–Historical daily and daily cumulative sockeye salmon passage at the Tatlawiksuk River weir.

	Daily Passage								Cumulative Passage							
Date	**1998**	**1999**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**1998**	**1999**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**
6/12[a]								0								
6/13[a]								0								
6/14[a]								0								
6/15	0 [b]	0	0	0 [b]	0 [b]	[c]	0	0	0	0	0	0	0		0	0
6/16	0 [b]	0	0	0 [b]	0 [b]	[c]	0	0	0	0	0	0	0		0	0
6/17	0 [b]	0	0	0 [b]	0 [d]	[c]	0	0	0	0	0	0	0		0	0
6/18	0	0	0	0 [b]	0	[c]	0	0	0	0	0	0	0		0	0
6/19	0	0	0	0 [b]	0	[c]	0	0	0	0	0	0	0		0	0
6/20	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6/21	0	0	0	1	0	0	0	0	0	0	0	1	0	0	0	0
6/22	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0
6/23	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0
6/24	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0
6/25	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0
6/26	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0
6/27	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0
6/28	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0
6/29	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0
6/30	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0
7/01	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0
7/02	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0
7/03	0	0	0	0	0	[c]	0	0	0	0	0	1	0		0	0
7/04	0	0	0	0	0	[c]	0	0	0	0	0	1	0		0	0
7/05	0	0	0	0	0	[c]	0	0 [e]	0	0	0	1	0		0	0
7/06	0	0	0	0	0	[c]	0	0	0	0	0	1	0		0	0
7/07	0	0	0	0	0	[c]	0	0	0	0	0	1	0		0	0
7/08	[c]	0	0	0	0	[c]	0	0		0	0	1	0		0	0
7/09	[c]	0	0	0	0	[c]	0	0		0	0	1	0		0	0
7/10	[c]	0	0	0	0	[c]	0	0		0	0	1	0		0	0
7/11	[c]	0 [e]	0	0	0	[c]	0	0		0	0	1	0		0	0
7/12	[c]	0	0	0	0	[c]	0	0		0	0	1	0		0	0
7/13	[c]	0	0	1	0	[c]	0	1		0	0	2	0		0	1
7/14	[c]	0	0	1	0	[c]	0	1		0	0	3	0		0	2
7/15	[c]	0	0	0	0	[c]	0	0		0	0	3	0		0	2
7/16	[c]	0	0	0	0	[c]	0	3		0	0	3	0		0	5

-continued-

	Daily Passage								Cumulative Passage							
Date	**1998**	**1999**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**1998**	**1999**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**
7/17	[c]	0	0	0	0	[c]	0	2		0	0	3	0		0	7
7/18	[c]	0	0	0	0	[c]	0	1		0	0	3	0		0	8
7/19	[c]	0	0	0	0	[c]	1	2		0	0	3	0		1	10
7/20	[c]	0	0	0	0	[c]	0	4		0	0	3	0		1	14
7/21	[c]	0	0	0	0	[c]	0	1		0	0	3	0		1	15
7/22	[c]	0	0	0	0	[c]	0	2		0	0	3	0		1	17
7/23	[c]	0	0	0	0	[c]	0	2		0	0	3	0		1	19
7/24	[c]	0	0	0 [d]	0	[c]	0	3		0	0	3	0		1	22
7/25	[c]	0	0	0 [d]	0	[c]	0	2		0	0	3	0		1	24
7/26	[c]	0	0	0	0	[c]	0	4		0	0	3	0		1	28
7/27	[c]	1 [e]	0	0 [d]	0	[c]	0	2		1	0	3	0		1	30
7/28	[c]	2	0	0	0	[c]	0	3		3	0	3	0		1	33
7/29	[c]	0	0	0	0	[c]	0	1		3	0	3	0		1	34
7/30	[c]	0	0	0	0	[c]	0	4		3	0	3	0		1	38
7/31	[c]	0	0	0 [d]	0	[c]	1	0		3	0	3	0		2	38
8/01	[c]	0	0	0 [b]	0	[c]	0	2		3	0	3	0		2	40
8/02	[c]	0	0	0 [b]	0	[c]	0	2		3	0	3	0		2	42
8/03	[c]	2	0	0 [d]	0	[c]	0	2		5	0	3	0		2	44
8/04	[c]	0	0	0	0	[c]	0	2		5	0	3	0		2	46
8/05	[c]	0	0	0	0	[c]	1	0		5	0	3	0		3	46
8/06	[c]	0	0	0	0	[c]	0	8		5	0	3	0		3	54
8/07	[c]	0	0	0	0	[c]	0	4 [e]		5	0	3	0		3	58
8/08	[c]	0	0	0	0	[c]	0	2		5	0	3	0		3	60
8/09	[c]	0	0	0	0	[c]	0	5		5	0	3	0		3	65
8/10	[c]	0 [b]	0	0	0	[c]	1	4		5	0	3	0		4	69
8/11	[c]	0 [b]	0	0	0	[c]	2	2		5	0	3	0		6	71
8/12	[c]	0 [b]	0	0	0	[c]	0	0		5	0	3	0		6	71
8/13	[c]	0 [b]	0	0	0	[c]	0	0		5	0	3	0		6	71
8/14	[c]	0 [b]	0 [d]	0	0	[c]	0	0		5	0	3	0		6	71
8/15	[c]	0 [b]	0 [b]	0	0	[c]	0	1		5	0	3	0		6	72
8/16	[c]	0 [b]	0 [b]	0	0	[c]	0	0		5	0	3	0		6	72
8/17	[c]	0 [b]	0 [b]	0 [b]	0	[c]	0	1		5	0	3	0		6	73
8/18	[c]	0 [b]	0 [b]	0 [b]	0	[c]	0	0		5	0	3	0		6	73
8/19	[c]	0 [b]	0 [b]	0 [b]	0	[c]	0	0		5	0	3	0		6	73
8/20	[c]	0 [b]	0 [b]	0 [b]	0	[c]	0	0		5	0	3	0		6	73

-continued-

Appendix B4.–Page 3 of 3.

	Daily Passage								Cumulative Passage							
Date	**1998**	**1999**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**1998**	**1999**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**
8/21	[c]	0 [b]	0 [b]	0 [b]	0	[c]	0	0		5	0	3	0		6	73
8/22	[c]	0 [b]	[b]	0 [b]	0	[c]	0	0		5	0	3	0		6	73
8/23	[c]	0 [b]	[b]	0 [b]	0	[c]	0	0		5	0	3	0		6	73
8/24	[c]	0	[b]	0 [b]	0	[c]	0	0		5	0	3	0		6	73
8/25	[c]	0	[b]	0 [b]	0	[c]	1	0		5	0	3	0		7	73
8/26	[c]	0 [e]	[b]	0 [b]	0	[c]	0	0		5	0	3	0		7	73
8/27	[c]	0	[b]	0 [d]	0	[c]	0	1		5	0	3	0		7	74
8/28	[c]	0	[b]	0	0	[c]	0	1		5	0	3	0		7	75
8/29	[c]	0	[b]	0	1	[c]	0	0		5	0	3	1		7	75
8/30	[c]	0	[b]	0	0	[c]	0	1		5	0	3	1		7	76
8/31	[c]	0	[b]	0	0	[c]	0	0		5	0	3	1		7	76
9/01	[c]	0	[b]	0	0	[c]	0	1		5	0	3	1		7	77
9/02	[c]	1	[b]	0	0	[c]	0	0		6	0	3	1		7	77
9/03	[c]	0	[b]	0	0	[c]	0	0		6	0	3	1		7	77
9/04	[c]	0	[b]	0	0	[c]	0	0		6	0	3	1		7	77
9/05	[c]	0	[b]	0	0	[c]	1	0		6	0	3	1		8	77
9/06	[c]	0	[b]	0	0	[c]	0	0		6	0	3	1		8	77
9/07	[c]	0	[b]	0	0	[c]	0	0		6	0	3	1		8	77
9/08	[c]	0	[b]	0	0	[c]	0	0		6	0	3	1		8	77
9/09	[c]	0	[b]	0	0	[c]	0	0		6	0	3	1		8	77
9/10	[c]	0	[b]	0	0	[c]	1	0 [b]		6	0	3	1		9	77
9/11	[c]	0	[b]	0	0	[c]	0	0 [b]		6	0	3	1		9	77
9/12	[c]	0	[b]	0	0 [d]	[c]	0	0 [b]		6	0	3	1		9	77
9/13	[c]	0	[b]	0	0 [b]	[c]	0	0 [b]		6	0	3	1		9	77
9/14	[c]	0	[b]	0	0 [b]	[c]	0	0 [b]		6	0	3	1		9	77
9/15	[c]	0	[b]	0	0 [b]	[c]	0	0 [b]		6	0	3	1		9	77
9/16	[c]	0	[b]	0 [b]	0 [b]	[c]	0	0 [b]		6	0	3	1		9	77
9/17	[c]	0	[b]	0 [b]	0 [b]	[c]	0	0 [b]		6	0	3	1		9	77
9/18	[c]	0	[b]	0 [b]	0 [b]	[c]	1	0 [b]		6	0	3	1		10	77
9/19	[c]	0	[b]	0 [b]	0 [b]	[c]	[c]	0 [b]		6	0	3	1		10	77
9/20	[c]	0	[b]	0 [b]	0 [d]	[c]	[c]	0		6	0	3	1		10	77

[a] Date outside of target operational period (not included in accumulative totals).
[b] The weir was not operational; daily passage was estimated.
[c] The weir was not operational; daily passage was not estimated.
[d] Partial day count; passage was estimated.
[e] Daily passage was estimated due to the occurrence of a hole in the weir.

APPENDIX C. DAILY PASSAGE OF PINK SALMON AND NON-SALMON SPECIES

Appendix C1.–Daily passage of pink salmon and non-salmon species at the Tatlawiksuk River weir, 2005.

Date	Pink Salmon	Longnose Sucker	Whitefish	Arctic Grayling	Northern Pike
6/15	0	153	0	0	0
6/16	0	384	0	3	0
6/17	0	219	0	5	0
6/18	0	37	0	0	0
6/19	0	57	0	0	0
6/20	0	25	0	0	1
6/21	0	20	0	0	0
6/22	0	50	0	2	0
6/23	0	30	0	1	0
6/24	0	120	0	1	0
6/25	0	25	0	0	0
6/26	0	53	0	0	0
6/27	0	19	0	0	0
6/28	0	9	0	0	0
6/29	0	16	0	0	0
6/30	0	4	0	0	0
7/1	0	5	0	0	0
7/2	0	2	0	0	0
7/3	0	1	0	0	0
7/4	0	2	0	0	0
7/5	0	20[a]	0	0	1
7/6	0	48	1	0	0
7/7	0	30	0	1	0
7/8	0	16	0	0	0
7/9	0	1	1	0	2
7/10	0	3	0	0	0
7/11	0	0	0	0	0
7/12	0	1	0	0	1
7/13	0	0	0	0	0
7/14	0	0	1	0	0
7/15	0	2	2	0	0
7/16	0	1	0	0	0
7/17	0	0	1	0	0
7/18	0	0	0	0	0
7/19	0	0	0	0	0
7/20	0	0	0	0	0
7/21	0	0	0	0	0
7/22	0	0	0	0	0
7/23	0	0	1	0	0
7/24	0	1	0	0	0
7/25	0	2	0	0	0
7/26	0	0	0	0	0
7/27	0	0	0	0	0
7/28	0	0	0	0	0
7/29	1	0	0	0	0
7/30	0	1	0	0	0
7/31	0	0	0	0	0
8/1	0	1	0	1	0
8/2	0	0	0	0	0
8/3	0	0	0	1	0
8/4	0	0	0	0	0
8/5	0	0	0	0	0
8/6	0	0	0	0	0
8/7	0	0[a]	0	0	0
8/8	0	0	0	0	0
8/9	0	0	0	0	1

-continued-

Appendix C1.–Page 2 of 2.

Date	Pink Salmon	Longnose Sucker	Whitefish	Arctic Grayling	Northern Pike
8/10	0	0	0	0	1
8/11	0	0	0	0	0
8/12	0	0	0	0	0
8/13	0	0	0	0	0
8/14	0	0	0	0	0
8/15	0	0	0	0	0
8/16	0	0	0	0	0
8/17	0	0	0	0	0
8/18	0	0	0	0	0
8/19	0	0	0	0	0
8/20	0	0	0	0	0
8/21	0	0	0	0	0
8/22	0	0	0	0	0
8/23	0	0	0	0	0
8/24	0	0	0	0	0
8/25	0	0	0	0	0
8/26	0	0	0	0	0
8/27	0	0	0	0	0
8/28	0	0	0	0	0
8/29	0	1	0	0	0
8/30	0	0	0	0	0
8/31	0	0	0	0	0
9/1	0	0	0	0	0
9/2	0	0	0	0	0
9/3	0	0	0	0	0
9/4	0	0	0	0	0
9/5	0	0	0	0	0
9/6	0	0	0	0	0
9/7	0	0	0	0	1
9/8	0	0	0	0	0
9/9	0	0	0	0	0
9/10	0[b]	0[b]	0[b]	0[b]	0[b]
9/11	0[b]	0[b]	0[b]	0[b]	0[b]
9/12	0[b]	0[b]	0[b]	0[b]	0[b]
9/13	0[b]	0[b]	0[b]	0[b]	0[b]
9/14	0[b]	0[b]	0[b]	0[b]	0[b]
9/15	0[b]	0[b]	0[b]	0[b]	0[b]
9/16	0[b]	0[b]	0[b]	0[b]	0[b]
9/17	0[b]	0[b]	0[b]	0[b]	0[b]
9/18	0[b]	0[b]	0[b]	0[b]	0[b]
9/19	0[b]	0[b]	0[b]	0[b]	0[b]
9/20	0	0	0	0	0
Total	1	1,359	7	15	8

APPENDIX D. DAILY CARCASS COUNTS

Appendix D1.–Daily carcass counts for Chinook, sockeye, chum, and coho salmon and longnose suckers at the Tatlawiksuk River weir, 2005.

	Chinook			Sockeye			Chum			Coho			longnose sucker
Date	Male	Female	Total	Male	Female	Total	Male	Female	Total	Male	Female	Total	Total
6/12	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
6/13	0	0	0	0	0	0	0	0	0	0	0	0	1
6/14	0	0	0	0	0	0	0	0	0	0	0	0	2
6/15	0	0	0	0	0	0	0	0	0	0	0	0	0
6/16	0	0	0	0	0	0	0	0	0	0	0	0	1
6/17	0	0	0	0	0	0	0	0	0	0	0	0	0
6/18	0	0	0	0	0	0	0	0	0	0	0	0	2
6/19	0	0	0	0	0	0	0	0	0	0	0	0	1
6/20	0	0	0	0	0	0	0	0	0	0	0	0	1
6/21	0	0	0	0	0	0	0	0	0	0	0	0	0
6/22	0	0	0	0	0	0	0	0	0	0	0	0	0
6/23	0	0	0	0	0	0	0	0	0	0	0	0	1
6/24	0	0	0	0	0	0	0	0	0	0	0	0	0
6/25	0	0	0	0	0	0	0	0	0	0	0	0	3
6/26	0	0	0	0	0	0	0	0	0	0	0	0	0
6/27	0	0	0	0	0	0	0	0	0	0	0	0	0
6/28	0	0	0	0	0	0	0	0	0	0	0	0	1
6/29	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
6/30	0	0	0	0	0	0	0	0	0	0	0	0	1
7/1	0	0	0	0	0	0	0	0	0	0	0	0	1
7/2	0	0	0	0	0	0	0	0	0	0	0	0	0
7/3	0	0	0	0	0	0	1	1	2	0	0	0	0
7/4	0	0	0	0	0	0	1	0	1	0	0	0	1
7/5	0	0	0	0	0	0	2	0	2	0	0	0	0
7/6	0	0	0	0	0	0	0	0	0	0	0	0	0
7/7	0	0	0	0	0	0	1	2	3	0	0	0	2
7/8	0	0	0	0	0	0	2	1	3	0	0	0	2
7/9	0	0	0	0	0	0	10	3	13	0	0	0	2
7/10	0	0	0	0	0	0	10	8	18	0	0	0	4
7/11	0	0	0	0	0	0	13	9	22	0	0	0	6
7/12	0	1	1	0	0	0	19	4	23	0	0	0	0
7/13	0	1	1	0	0	0	16	6	22	0	0	0	0
7/14	0	0	0	0	0	0	23	12	35	0	0	0	2
7/15	0	0	0	0	0	0	24	17	41	0	0	0	2
7/16	0	1	1	0	0	0	28	25	53	0	0	0	5
7/17	0	0	0	0	0	0	19	10	29	0	0	0	5
7/18	0	0	0	0	0	0	14	4	18	0	0	0	3
7/19	0	0	0	0	0	0	27	19	46	0	0	0	1
7/20	0	0	0	0	0	0	31	18	49	0	0	0	1
7/21	0	0	0	0	0	0	15	5	20	0	0	0	4
7/22	1	0	1	0	0	0	75	21	96	0	0	0	2
7/23	0	0	0	0	0	0	58	39	97	0	0	0	3
7/24	0	0	0	0	0	0	48	25	73	0	0	0	4
7/25	0	0	0	0	0	0	45	19	64	1	1	1	2
7/26	0	1	1	0	0	0	31	17	48	0	0	0	4
7/27	1	0	1	0	0	0	36	13	49	0	0	0	3
7/28	0	0	0	0	0	0	23	14	37	0	0	0	2
7/29	0	0	0	0	0	0	22	14	36	0	0	0	7
7/30	0	0	0	0	0	0	22	12	34	0	0	0	1
7/31	0	0	0	1	0	1	34	10	44	0	0	0	3
8/1	0	0	0	0	0	0	34	16	50	0	0	0	2
8/2	0	0	0	2	0	2	37	10	47	0	0	0	2
8/3	1	0	1	0	0	0	37	9	46	0	0	0	2
8/4	0	0	0	0	0	0	19	10	29	0	0	0	1
8/5	0	0	0	1	0	1	18	6	24	0	0	0	7
8/6	0	0	0	0	0	0	13	5	18	0	0	0	1
8/7	0	0	0	0	0	0	11	6	17	0	0	0	1
8/8	0	0	0	0	0	0	8	4	12	0	0	0	1
8/9	0	0	0	0	0	0	11	7	18	1	0	1	2

-continued-

Appendix D1.–Page 2 of 2.

Date	Chinook			Sockeye			Chum			Coho			longnose sucker
	Male	Female	Total	Male	Female	Total	Male	Female	Total	Male	Female	Total	Total
8/10	0	0	0	0	0	0	14	4	18	0	1	1	2
8/11	0	0	0	0	0	0	6	7	13	1	0	1	6
8/12	0	0	0	0	0	0	11	3	14	0	0	0	3
8/13	0	0	0	0	0	0	16	5	21	0	0	0	3
8/14	0	0	0	0	0	0	4	4	8	0	0	0	4
8/15	0	0	0	0	0	0	4	3	7	0	0	0	4
8/16	0	0	0	0	0	0	4	0	4	0	0	0	7
8/17	0	0	0	0	0	0	3	1	4	0	0	0	4
8/18	0	0	0	0	0	0	5	0	5	0	0	0	3
8/19	0	0	0	0	0	0	2	2	4	0	0	0	1
8/20	0	0	0	0	0	0	2	0	2	0	0	0	3
8/21	0	0	0	0	0	0	5	0	5	0	0	0	3
8/22	0	0	0	0	0	0	1	0	1	0	0	0	2
8/23	0	0	0	0	0	0	0	0	0	0	0	0	4
8/24	0	0	0	0	0	0	2	0	2	0	0	0	0
8/25	0	0	0	0	0	0	0	1	1	0	0	0	5
8/26	0	0	0	0	0	0	0	0	0	0	0	0	0
8/27	0	0	0	0	0	0	1	2	3	0	0	0	0
8/28	0	0	0	0	0	0	1	0	1	0	0	0	1
8/29	0	0	0	0	0	0	0	0	0	0	0	0	1
8/30	0	0	0	0	0	0	2	0	2	0	0	0	2
8/31	0	0	0	1	0	1	0	0	0	1	0	1	18
9/1	0	0	0	0	0	0	0	0	0	0	0	0	25
9/2	0	0	0	0	0	0	0	0	0	0	0	0	2
9/3	0	0	0	0	0	0	0	0	0	0	0	0	2
9/4	0	0	0	0	0	0	0	1	1	0	0	0	1
9/5	0	0	0	0	0	0	0	0	0	0	0	0	0
9/6	0	0	0	0	0	0	0	0	0	0	0	0	0
9/7	0	0	0	0	0	0	0	0	0	0	0	0	0
9/8	0	0	0	0	0	0	0	0	0	1	1	2	1
9/9	0	0	0	0	0	0	1	0	1	1	0	1	1
9/10	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
9/11	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
9/12	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
9/13	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
9/14	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
9/15	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
9/16	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
9/17	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
9/18	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
9/19	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
9/20	0	0	0	1	0	1	0	0	0	3	0	3	30
9/21	0	0	0	0	0	0	0	0	0	4	0	4	12
9/22	0	0	0	0	0	0	0	0	0	2	0	2	18
Totals:	3	4	7	6	0	6	922	434	1,356	15	3	17	273

APPENDIX E. WEATHER AND STREAM OBSERVATIONS

Appendix E1.–Daily weather and stream observations at the Tatlawiksuk River weir, 2005.

Observations by Hour							Daily Totals	Daily Averages			
Date	Time	Sky Codes[a]	Wind	Air Temperature (°C)	Water Temperature (°C)	Water Stage (cm)	Precipitation (mm)	Air Temperature (°C)[b]	Obs. Water Temperature (°C)[b]	Water Stage (cm) (°C)[b]	Logged Water Temperature (°C)[c]
6/10	7:30	1	0	ND	ND	39.0	0.0	-	-	-	-
6/11	8:30	4	0	11.5	8.5	38.0					
	17:00	2	S 10	15.0	13.0	38.0	12.5	13.3	10.8	38.0	12.5
6/12	9:30	1	0	12.0	10.5	41.0	4.4	-	-	-	12.7
6/13	7:30	3	0	9.0	11.0	42.0					
	17:00	4	5- 10 [d]	19.0	13.0	42.0	0.1	14.0	12.0	42.0	13.1
6/14	7:30	2	0	10.0	10.5	39.0					
	17:00	3	0 [d]	18.5	13.5	39.0	0.1	14.3	12.0	39.0	13.7
6/15	7:30	3	0	13.0	9.0	37.0					
	17:00	2	5- 10	26.0	10.0	37.0	0.5	19.5	9.5	37.0	15.3
6/16	7:30	2	0	8.0	12.0	35.0					
	17:00	3	NW 5	26.0	17.0	35.0	0.0	17.0	14.5	35.0	16.0
6/17	7:30	1	0	10.0	12.0	33.0					
	17:00	3	N 5	30.0	16.5	33.0	0.0	20.0	14.3	33.0	16.2
6/18	7:30	4	S 10	11.0	12.0	33.0					
	17:00	4	S 10	11.5	13.5	34.0	12.0	11.3	12.8	33.5	14.9
6/19	7:30	4	0	10.0	12.0	48.0					
	17:00	4	SW 10	11.5	13.0	56.0	11.0	10.8	12.5	52.0	12.5
6/20	7:30	3	0	8.0	12.0	66.0					
	17:00	3	W 5	19.5	12.0	66.0	1.5	13.8	12.0	66.0	11.8
6/21	7:30	4	0	10.0	12.0	60.0					
	17:00	2	W 10	23.0	15.0	57.0	0.0	16.5	13.5	58.5	12.8
6/22	7:30	3	0	10.0	11.5	56.0					
	17:00	4	SW 5	16.0	11.5	56.0	1.4	13.0	11.5	56.0	13.5
6/23	7:30	4	0	11.0	10.0	57.0					
	17:00	4	0	20.0	13.0	56.0	0.4	15.5	11.5	56.5	13.4
6/24	7:30	4	0	13.0	11.0	53.0					
	17:00	3	0	24.5	14.0	49.0	0.0	18.8	12.5	51.0	14.2
6/25	10:00	1	0	18.0	11.0	42.0					
	17:00	3	0	21.0	15.0	40.0	9.5	19.5	13.0	41.0	15.1
6/26	10:00	1 [e]	0	19.0	10.0	39.0					
	17:00	4 [e]	N 5	22.0	16.0	37.0	0.0	20.5	13.0	38.0	15.2
6/27	7:30	1	0	13.0	14.0	35.0					
	17:00	1 [e]	N 5- 10	27.0	16.0	35.0	0.0	20.0	15.0	35.0	15.4
6/28	7:30	1 [e]	0	10.0	14.0	32.0					
	17:00	4 [e]	Var 5- 10	29.0	18.0	30.0	0.0	19.5	16.0	31.0	15.8

-continued-

Appendix E1.–Page 2 of 7.

				Observations by Hour			Daily Totals	Daily Averages			
Date	Time	Sky Codes[a]	Wind	Air Temperature (°C)	Water Temperature (°C)	Water Stage (cm)	Precipitation (mm)	Air Temperature (°C)[b]	Obs. Water Temperature (°C)[b]	Water Stage (cm) (°C)[b]	Logged Water Temperature (°C)[c]
6/29	7:30	4[e]	0	10.0	15.0	30.0					
	17:00	2	N 10- 15	29.0	17.0	29.0	0.0	19.5	16.0	29.5	15.8
6/30	7:30	4	0	12.0	15.0	29.0					
	17:00	4	ND	ND	ND	ND	0.0	12.0	15.0	29.0	14.6
7/1	7:00	4	0	12.0	11.0	31.0	1.9	-	-	-	12.9
7/2	7:30	3	0	14.0	13.0	30.0					
	17:00	2	S 5	25.0	15.0	30.0	0.6	19.5	14.0	30.0	13.5
7/3	7:30	4	0	16.0	14.0	29.0					
	17:00	3	Var 5	20.0	16.0	29.0	0.5	18.0	15.0	29.0	15.0
7/4	7:30	4	0	12.0	13.0	29.0					
	17:00	3	Var 10	20.0	17.0	29.0	1.7	16.0	15.0	29.0	15.6
7/5	7:30	3	0	11.0	15.0	31.0					
	17:00	3	Var 5	20.0	17.0	34.0	0.1	15.5	16.0	32.5	16.1
7/6	8:30	2	0	13.0	14.0	37.0					
	17:00	3	NW 10	18.0	17.0	38.0	1.4	15.5	15.5	37.5	16.4
7/7	7:30	2	0	15.0	15.0	35.0					
	17:00	1	W 5	22.0	17.0	34.0	0.0	18.5	16.0	34.5	16.5
7/8	7:30	2	0	10.0	15.0	32.0					
	17:00	2	0	26.0	16.0	31.0	0.0	18.0	15.5	31.5	16.5
7/9	7:30	2	0	14.0	15.0	29.0					
	17:00	2	SW 15	25.0	17.0	28.0	0.0	19.5	16.0	28.5	16.9
7/10	7:30	4	SW 15	14.0	12.0	27.0					
	17:00	2	SW 15	25.0	18.0	26.0	0.0	19.5	15.0	26.5	16.9
7/11	7:30	4	SW 15	11.0	14.0	24.0					
	17:00	3	SW 15	20.0	16.0	23.0	0.0	15.5	15.0	23.5	16.3
7/12	7:30	4	0	10.0	11.0	23.0					
	17:00	4	0	17.0	15.0	22.0	1.6	13.5	13.0	22.5	15.1
7/13	7:30	5	0	9.0	12.0	22.0					
	17:00	3	0	27.0	16.0	22.0	4.0	18.0	14.0	22.0	14.7
7/14	7:30	1	0	7.0	12.0	22.0					
	17:00	2	0	27.0	15.0	22.0	0.0	17.0	13.5	22.0	15.5
7/15	7:30	1[e]	0	8.0	12.0	22.0					
	17:00	3	SW 15	26.0	14.0	21.0	0.0	17.0	13.0	21.5	16.2
7/16	9:00	4	0	14.0	13.0	21.0					
	17:00	4	0	16.0	16.0	22.0	2.8	15.0	14.5	21.5	16.2

-continued-

Appendix E1.–Page 3 of 7.

				Observations by Hour			Daily Totals	Daily Averages			
Date	Time	Sky Codes[a]	Wind	Air Temperature (°C)	Water Temperature (°C)	Water Stage (cm)	Precipitation (mm)	Air Temperature (°C)[b]	Obs. Water Temperature (°C)[b]	Water Stage (cm) (°C)[b]	Logged Water Temperature (°C)[c]
7/17	9:00	3	0	17.0	14.0	22.0					
	17:00	4	0	20.0	14.0	23.0	8.5	18.5	14.0	22.5	15.3
7/18	7:30	2	0	8.0	13.0	25.0					
	17:00	3	NE 5- 10	22.0	13.5	25.0	1.0	15.0	13.3	25.0	14.6
7/19	7:30	4	N 5- 10	12.0	13.0	26.5					
	17:00	4	N 5- 10	14.5	14.0	26.5	3.5	13.3	13.5	26.5	14.0
7/20	7:30	1	0	11.0	12.0	26.5					
	17:00	1	E 5- 10	24.5	15.0	26.5	0.0	17.8	13.5	26.5	13.8
7/21	7:30	1	E 10	11.5	13.0	26.5					
	17:00	1	0	24.5	17.0	25.0	0.0	18.0	15.0	25.8	14.9
7/22	7:30	3	W 0-5	16.5	13.0	25.0					
	17:00	3	0	22.0	17.0	23.0	0.0	19.3	15.0	24.0	16.3
7/23	10:00	1	W 0-5	19.0	14.5	21.0					
	17:00	1	0	25.5	18.0	20.0	0.0	22.3	16.3	20.5	16.9
7/24	10:00	2	0	19.5	15.0	19.0					
	17:00	3	SW 10	26.5	18.0	18.5	0.0	23.0	16.5	18.8	17.4
7/25	7:30	3	0	11.5	16.0	19.0					
	17:00	3	W 5	20.5	16.0	18.0	0.0	16.0	16.0	18.5	16.6
7/26	7:30	5	0	8.0	14.0	18.0					
	17:00	3	NE 5	22.5	18.0	18.0	0.7	15.3	16.0	18.0	15.7
7/27	7:30	1 [e]	0	6.5	13.0	19.0					
	17:00	2 [e]	NE 15	25.5	16.5	20.0	0.3	16.0	14.8	19.5	15.7
7/28	7:30	3 [e]	0	10.0	14.5	19.0					
	17:00	4 [e]	0	18.5	15.0	18.5	3.7	14.3	14.8	18.8	15.4
7/29	7:30	2 [e]	0	9.5	13.5	18.0					
	17:00	3	NW 15	19.5	16.0	18.0	1.8	14.5	14.8	18.0	14.9
7/30	7:30	4	0	11.5	14.0	19.0					
	17:00	3	0	20.5	15.5	20.0	0.0	16.0	14.8	19.5	15.2
7/31	7:30	4	0	10.5	14.0	22.0					
	17:00	1	NW [f]	21.0	16.0	22.0	5.3	15.8	15.0	22.0	15.2
8/1	7:30	1	0	4.5	13.0	24.0					
	17:00	2	0	20.5	16.0	23.5	0.0	12.5	14.5	23.8	14.9
8/2	7:30	3	0	7.5	13.0	22.5					
	17:00	2	SW 5	19.5	15.0	21.0	6.0	13.5	14.0	21.8	14.4
8/3	7:30	2	0	3.0	13.0	20.0					
	17:00	2	N 5	22.5	16.0	20.0	0.4	12.8	14.5	20.0	14.8

-continued-

Appendix E1.–Page 4 of 7.

				Observations by Hour			Daily Totals	Daily Averages			
Date	Time	Sky Codes[a]	Wind	Air Temperature (ºC)	Water Temperature (ºC)	Water Stage (cm)	Precipitation (mm)	Air Temperature (ºC)[b]	Obs. Water Temperature (ºC)[b]	Water Stage (cm) (ºC)[b]	Logged Water Temperature (ºC)[c]
8/4	7:30	2	0	3.0	13.0	19.0					
	17:00	1	0	24.0	15.5	19.0	0.0	13.5	14.3	19.0	14.6
8/5	7:30	5 [e]	0	3.0	13.0	18.0					
	17:00	4	SW 5	20.0	15.0	18.0	0.0	11.5	14.0	18.0	14.2
8/6	7:30	2	0	6.0	13.0	18.0					
	17:00	3	SW 15	19.0	15.0	18.0	0.0	12.5	14.0	18.0	14.3
8/7	7:30	4	0	12.0	13.5	17.5					
	17:00	4	0	17.0	14.5	17.0	0.0	14.5	14.0	17.3	14.3
8/8	7:30	3	0	10.0	13.5	16.5					
	17:00	1	0	23.5	16.5	16.0	0.0	16.8	15.0	16.3	14.9
8/9	7:30	1	0	4.0	14.0	15.0					
	17:00	1	SW 5	27.0	17.0	15.0	0.0	15.5	15.5	15.0	15.9
8/10	7:30	1	0	6.5	15.0	15.0					
	17:00	2	S 5	25.5	17.5	14.5	0.0	16.0	16.3	14.8	16.6
8/11	7:30	2	0	5.0	14.5	13.5					
	17:00	1	0	26.5	18.0	13.0	0.0	15.8	16.3	13.3	16.6
8/12	7:30	-- [g]	0	11.5	15.0	12.5					
	17:00	2	0	26.5	17.0	12.5	0.0	19.0	16.0	12.5	16.6
8/13	7:30	5 [e]	0	6.5	14.5	12.0					
	17:00	-- [g]	0	26.0	17.0	12.0	0.0	16.3	15.8	12.0	16.2
8/14	7:30	-- [g]	0	15.0	15.0	11.5					
	17:00	-- [g]	0	26.0	16.5	11.5	0.0	20.5	15.8	11.5	15.9
8/15	7:30	-- [g]	0	11.0	13.0	11.5					
	17:00	2	W 5	22.5	15.5	11.5	0.0	16.8	14.3	11.5	15.6
8/16	7:30	3	0	13.0	14.5	10.0					
	17:00	3	0	24.0	16.0	10.0	0.0	18.5	15.3	10.0	15.6
8/17	7:30	4 [e]	0	11.5	14.0	12.0					
	17:00	4	0	18.0	15.0	12.0	4.5	14.8	14.5	12.0	15.3
8/18	7:30	4 [e]	0	13.5	14.0	12.0					
	17:00	-- [g]	NW 5	18.5	15.0	12.0	0.9	16.0	14.5	12.0	14.7
8/19	7:30	-- [g]	0	5.0	11.5	12.0					
	17:00	-- [g]	0	17.0	13.5	12.0	0.0	11.0	12.5	12.0	13.3
8/20	7:30	-- [g]	0	6.0	11.5	11.5					
	17:00	4	SW 10	13.5	11.5	11.0	0.0	9.8	11.5	11.3	12.1
8/21	7:30	4	SW 10	9.5	11.0	12.0					
	17:00	4	SW 5	13.0	12.0	12.5	7.6	11.3	11.5	12.3	11.6

-continued-

Appendix E1.–Page 5 of 7.

				Observations by Hour			Daily Totals	Daily Averages			
Date	Time	Sky Codes[a]	Wind	Air Temperature (°C)	Water Temperature (°C)	Water Stage (cm)	Precipitation (mm)	Air Temperature (°C)[b]	Obs. Water Temperature (°C)[b]	Water Stage (cm) (°C)[b]	Logged Water Temperature (°C)[c]
8/22	7:30	5	0	2.0	10.0	14.0					
	17:00	4	0	13.0	11.0	14.5					
	21:00	0	ND	ND	ND	18.0	2.1	7.5	10.5	14.3	10.6
8/23	7:30	4	SW 5	11.5	10.0	22.0					
	12:00	0	ND	ND	ND	24.0					
	17:00	4	S 10	11.5	10.5	26.0	17.0	11.5	10.3	24.0	10.5
8/24	7:30	4	0	8.5	9.5	31.0					
	17:00	3	SW 15	11.5	10.5	39.0					
	21:00	0	ND	ND	ND	44.0	15.0	10.0	10.0	35.0	10.4
8/25	7:30	3	0	5.5	10.0	54.0					
	11:00	0	ND	ND	ND	56.0					
	17:00	3	0	15.5	12.0	59.5					
	20:00	0	ND	ND	ND	64.0	2.0	10.5	11.0	56.8	10.3
8/26	7:30	3	0	2.5	9.0	63.0					
	17:00	4	NW 10	11.0	10.0	58.0	0.6	6.8	9.5	60.5	9.9
8/27	7:30	3	0	4.0	9.0	54.0					
	17:00	4	SW 5	13.0	10.0	49.0	0.5	8.5	9.5	51.5	9.8
8/28	7:30	4	0	10.0	9.0	47.0					
	17:00	3	S 5	16.0	10.5	45.0	5.2	13.0	9.8	46.0	*10.1*
8/29	7:30	4	0	8.5	9.5	46.0					
	17:00	4	0	11.5	10.0	48.0	10.0	10.0	9.8	47.0	9.9
8/30	7:30	4	0	8.5	9.5	63.0					
	10:00	0	ND	ND	ND	65.0					
	13:00	0	ND	ND	ND	67.0					
	17:00	4	SW 5	16.0	9.0	71.5	1.1	12.3	9.3	67.3	9.9
8/31	7:30	4	0	8.5	9.5	75.0					
	17:00	3	SW 5- 10	13.0	11.0	72.0	0.7	10.8	10.3	73.5	10.0
9/1	7:30	1	0	-3.0	8.0	68.0					
	17:00	1	0	14.0	10.0	61.0	0.0	5.5	9.0	64.5	9.0
9/2	7:30	1	0	-4.5	7.5	60.0					
	13:00	0	ND	ND	ND	58.0					
	17:00	4	SW 10	14.5	8.5	57.0	0.0	5.0	8.0	58.5	8.1
9/3	7:30	4	0	7.0	8.0	54.0					
	17:00	4	0	10.0	8.5	54.0	7.6	8.5	8.3	54.0	8.0

-continued-

Appendix E1.–Page 6 of 7.

				Observations by Hour			Daily Totals	Daily Averages			
Date	Time	Sky Codes[a]	Wind	Air Temperature (°C)	Water Temperature (°C)	Water Stage (cm)	Precipitation (mm)	Air Temperature (°C)[b]	Obs. Water Temperature (°C)[b]	Water Stage (cm) (°C)[b]	Logged Water Temperature (°C)[c]
9/4	7:30	4	0	8.5	8.0	58.0					
	15:00	0	ND	ND	ND	62.0					
	17:00	4	0	13.0	9.0	63.0					
	19:30	0	ND	ND	ND	65.0	11.0	10.8	8.5	60.5	8.3
9/5	7:30	4	0	9.5	9.0	67.0					
	13:00	0	ND	ND	ND	69.0					
	17:00	4	0	12.5	9.5	69.0	6.0	11.0	9.3	68.0	9.1
9/6	7:30	4	0	8.5	9.0	72.0					
	17:00	3	0	12.5	9.5	74.0	17.5	10.5	9.3	73.0	9.3
9/7	7:30	4	0	6.5	9.0	79.0					
	17:00	3	SW 5	13.0	10.0	79.0	1.0	9.8	9.5	79.0	9.3
9/8	7:30	2	0	-0.5	9.0	83.0	2.7	-	-	-	9.2
9/9	7:30	4	0	10.0	9.0	85.0					
	17:00	4	S 5	13.0	10.0	85.0	17.5	11.5	9.5	85.0	9.2
9/10	10:00	4	0	10.0	9.0	110.0					
	17:00	4	0	13.0	9.0	118.0	13.0	11.5	9.0	114.0	9.1
9/11	10:00	3	0	5.5	8.5	142.0					
	19:00	4	S 5	12.0	9.0	148.0	0.3	8.8	8.8	145.0	8.9
9/12	10:00	4	SE 10	8.5	8.5	138.0					
	17:00	3	S 5	11.0	8.5	131.0	3.2	9.8	8.5	134.5	8.7
9/13	10:00	4	0	8.0	8.0	124.0					
	17:00	4	0	9.5	8.0	123.0	4.5	8.8	8.0	123.5	8.6
9/14	10:00	4	0	11.0	8.0	121.0	4.2	-	-	-	8.2
9/15	ND	ND	ND	ND	ND	ND	ND	-	-	-	8.1
9/16	17:00	3	0	11.5	8.5	113.0	ND	-	-	-	8.2
9/17	10:00	4	0	7.0	8.0	112.0					
	17:00	4	0	12.0	9.0	110.0	0.6	9.5	8.5	111.0	8.4
9/18	10:00	3	0	4.0	7.5	104.0					
	17:00	3	0	11.5	8.0	101.0	0.3	7.8	7.8	102.5	8.0
9/19	10:00	3	0	3.5	7.0	97.0					
	17:00	4	0	12.0	7.5	94.0	0.0	7.8	7.3	95.5	7.5
9/20	10:00	4	0	5.5	6.5	90.0	0.0	-	-	-	6.9
9/21	10:00	4	0	8.0	6.0	81.0					
	17:00	4	0	8.0	6.5	80.0	0.0	8.0	6.3	80.5	6.3

-continued-

				Observations by Hour			Daily Totals	Daily Averages			
Date	Time	Sky Codes[a]	Wind	Air Temperature (°C)	Water Temperature (°C)	Water Stage (cm)	Precipitation (mm)	Air Temperature (°C)[b]	Obs. Water Temperature (°C)[b]	Water Stage (cm) (°C)[b]	Logged Water Temperature (°C)[c]
9/22	10:00	4	0	9.0	6.0	77.0					
	17:00	4	SE 10	10.0	7.0	79.0	7.5	9.5	6.5	78.0	6.6
9/23	10:00	3	SE 5	7.5	7.0	87.0	10.5	-	-	-	7.3
9/24	10:00	4	0	4.0	7.0	101.0	5.5	-	-	-	7.3
9/25	10:00	4	0	6.5	6.5	111.0	1.8	-	-	-	6.9
9/26	10:00	4	0	5.0	6.5	120.0	2.5	-	-	-	6.8
			Average:	14.3[h]	12.7[h]	42.8	2.7	14.3	12.7	39.7	12.9
			Minimum:	-4.5[h]	6.0[h]	10.0	0.0	5.0	6.3	10.0	6.3
			Maximum:	30.0[h]	18.0[h]	148.0	17.5	23.0	16.5	145.0	17.4
			Total:	-	-	-	283.6	-	-	-	-

[a] Sky Codes: 0 = no observation
1 = clear or mostly clear (<10% cloud cover)
2 = cloud cover less than 50% of the sky
3 = cloud cover more than 50% of the sky
4 = complete overcast

[b] Averages are calculated from the 7:00- 10:00 and the 17:00- 19:00 observations. Averages were not computed if no observations were made during one of these times.

[c] Average of all hourly records from 0:00 to 23:00.

[d] Wind direction is unknown.

[e] Smoke haze was present.

[f] Wind speed is unknown.

[g] Cloud cover was obscured by smoke haze.

[h] Calculated using only days with a morning observation between 7:00-10:00 and an afternoon observation between 17:00-19:00. Observations outside of these times were ignored.

[i] Calculated using 7:00 to 10:00 morning observations only.

Appendix E2.–Daily stream temperature summary from data logger at the Tatlawiksuk River weir, 2005.

	Temperature (^oC)		
Date	Avg.	Min.	Max.
6/11	12.5	11.7	13.5
6/12	12.7	11.4	13.9
6/13	13.1	12.2	14.1
6/14	13.7	12.2	15.3
6/15	15.3	13.9	17.1
6/16	16.0	14.7	17.2
6/17	16.2	14.9	17.7
6/18	14.9	13.9	16.7
6/19	12.5	11.9	13.7
6/20	11.8	10.7	12.8
6/21	12.8	11.8	14.2
6/22	13.5	12.9	13.9
6/23	13.4	12.4	14.5
6/24	14.2	13.1	15.7
6/25	15.1	14.0	16.2
6/26	15.2	14.0	16.2
6/27	15.4	14.1	16.9
6/28	15.8	14.5	17.1
6/29	15.8	14.6	17.0
6/30	14.6	13.7	16.2
7/1	12.9	12.5	13.6
7/2	13.5	12.1	15.7
7/3	15.0	14.0	16.1
7/4	15.6	14.1	17.3
7/5	16.1	14.8	17.4
7/6	16.4	15.0	18.0
7/7	16.5	15.3	17.7
7/8	16.5	15.2	18.2
7/9	16.9	15.6	18.3
7/10	16.9	15.5	18.1
7/11	16.3	15.1	17.5
7/12	15.1	14.6	16.3
7/13	14.7	13.2	16.7
7/14	15.5	13.8	17.5
7/15	16.2	14.7	17.6
7/16	16.2	15.3	17.1
7/17	15.3	14.5	16.2
7/18	14.6	13.8	15.4
7/19	14.0	13.5	14.9
7/20	13.8	12.3	15.6
7/21	14.9	13.2	17.0
7/22	16.3	15.2	17.7
7/23	16.9	15.5	18.7
7/24	17.4	16.2	18.6
7/25	16.6	16.0	18.1
7/26	15.7	14.4	16.8
7/27	15.7	14.4	16.9
7/28	15.4	14.9	16.6
7/29	14.9	13.8	16.2
7/30	15.2	14.3	16.0
7/31	15.2	14.2	16.4
8/1	14.9	13.5	16.2
8/2	14.4	13.2	15.5
8/3	14.8	13.4	16.3

-continued-

	Temperature (^oC)		
Date	Avg.	Min.	Max.
8/4	14.6	13.3	15.8
8/5	14.2	13.3	15.0
8/6	14.3	13.2	15.4
8/7	14.3	13.7	14.8
8/8	14.9	13.6	17.0
8/9	15.9	14.3	17.7
8/10	16.6	15.3	18.0
8/11	16.6	15.2	18.1
8/12	16.6	15.6	17.7
8/13	16.2	15.3	17.1
8/14	15.9	15.0	16.7
8/15	15.6	14.9	16.3
8/16	15.6	14.8	16.6
8/17	15.3	14.8	16.2
8/18	14.7	14.3	15.1
8/19	13.3	12.4	14.4
8/20	12.1	11.6	13.2
8/21	11.6	11.2	12.0
8/22	10.6	10.1	11.6
8/23	10.5	10.4	10.7
8/24	10.4	10.0	11.0
8/25	10.3	9.8	10.9
8/26	9.9	9.4	10.5
8/27	9.8	9.2	10.5
8/28	10.1	9.8	10.5
8/29	9.9	9.7	10.2
8/30	9.9	9.5	10.4
8/31	10.0	9.6	10.4
9/1	9.0	8.2	9.8
9/2	8.1	7.5	8.9
9/3	8.0	7.9	8.2
9/4	8.3	7.9	9.0
9/5	9.1	8.9	9.5
9/6	9.3	9.0	9.6
9/7	9.3	8.9	9.8
9/8	9.2	8.7	9.6
9/9	9.2	9.1	9.5
9/10	9.1	8.9	9.3
9/11	8.9	8.7	9.1
9/12	8.7	8.5	8.9
9/13	8.6	8.4	8.7
9/14	8.2	8.0	8.5
9/15	8.1	7.9	8.3
9/16	8.2	8.0	8.5
9/17	8.4	8.2	8.7
9/18	8.0	7.7	8.3
9/19	7.5	7.2	7.8
9/20	6.9	6.6	7.2
9/21	6.3	6.1	6.7
9/22	6.6	6.3	7.2
9/23	7.3	7.1	7.5
9/24	7.3	7.1	7.5
9/25	6.9	6.7	7.2
9/26	6.8	6.7	7.0
Average:	12.9	12.1	13.9
Minimum:	6.3	6.1	6.7
Maximum:	17.4	16.2	18.7

Appendix E3.–Worksheet used to calculate river discharge at Tatlawiksuk River weir on 8 July, 2005.

Location: Tatlawiksuk River weir

Date: 07/08/2005

Description: Approx. 50 m downstream of weir

Gauge Height: 30 cm

Crew: Rob Stewart, Dan Costello, Harry Allain

Comments: Water level is low but within a normal range for this date.

Meter Type: AA

Station **Dist.** (m)	Stream **Depth** (m)	Meter **Height** (m)	Substrate Description	**Velocity** (m/sec) Point	Mean Vert.	Mean Cell	Cell Depth (m)	Width (m)	Area (m^2)	Flow (m^3/sec)
0	0.00	-	river left, gravel bar	0.00		-	-	-	-	-
3.1	0.23	0.09	gravels and sand	0.38		0.19	0.12	3.14	0.36	0.07
6.3	0.41	0.16	gravels and sand	0.75		0.56	0.32	3.14	1.01	0.57
9.4	0.45	0.18	gravels and sand	0.83		0.79	0.43	3.14	1.35	1.07
12.6	0.42	0.17	gravels and sand	0.80		0.81	0.44	3.14	1.37	1.11
15.7	0.37	0.15	gravels and sand	0.64		0.72	0.40	3.14	1.24	0.89
18.9	0.45	0.18	gravels and sand	0.86		0.75	0.41	3.14	1.29	0.97
22.0	0.54	0.22	gravels and sand	1.01		0.94	0.50	3.14	1.56	1.46
25.1	0.64	0.26	gravels and sand	1.00		1.01	0.59	3.14	1.85	1.86
28.3	0.69	0.28	gravels and sand	0.97		0.99	0.67	3.14	2.09	2.06
31.4	0.70	0.28	gravels and sand	1.04		1.01	0.70	3.14	2.18	2.19
34.6	0.70	0.28	gravels and sand	1.07		1.06	0.70	3.14	2.20	2.32
37.7	0.68	0.27	gravels and sand	1.03		1.05	0.69	3.14	2.17	2.28
40.9	0.58	0.23	gravels and sand	0.98		1.01	0.63	3.14	1.98	1.99
44.0	0.42	0.17	gravels and sand	0.80		0.89	0.50	3.14	1.57	1.40
47.1	0.25	0.10	gravels and sand	0.58		0.69	0.34	3.14	1.05	0.73
51.9	0.00	0.00	river right, gravel bar	0.00		0.29	0.13	4.71	0.59	0.17

Avg. Depth: 0.44 m

Max. Depth: 0.70 m

Avg. Velocity: 0.75 m/sec

Max.Velocity: 1.07 m/sec

Total Discharge: 21.1 m^3/sec

Appendix E4.–Worksheet used to calculate river discharge at Tatlawiksuk River weir on 10 August, 2005.

Location: Tatlawiksuk River weir

Date: 8/10/2005

Description: Approx. 50 m downstream of weir

Gauge Height: 15 cm

Crew: Rob Stewart, Alyssa Willis (KNA intern), Chris Gusty (KNA intern)

Comments: Water level is well below the normal range for this date.

Meter Type: AA

Station **Dist.** (m)	Stream **Depth** (m)	Meter **Height** (m)	Substrate Description	**Velocity** (m/sec) Point	Mean Vert.	Mean Cell	Cell Depth (m)	Width (m)	Area (m^2)	Flow (m^3/sec)
0.0	0.00	-	river left, gravel bar	0.00		-	-	-	-	-
3.1	0.12	0.05	gravels and sand	0.12		0.06	0.06	3.14	0.19	0.01
6.3	0.18	0.07	gravels and sand	0.59		0.36	0.15	3.14	0.47	0.17
9.4	0.23	0.09	gravels and sand	0.68		0.64	0.21	3.14	0.64	0.41
12.6	0.30	0.12	gravels and sand	0.69		0.69	0.27	3.14	0.83	0.57
15.7	0.39	0.16	gravels and sand	0.71		0.70	0.35	3.14	1.08	0.76
18.9	0.48	0.19	gravels and sand	0.75		0.73	0.44	3.14	1.37	1.00
22.0	0.55	0.22	gravels and sand	0.97		0.86	0.52	3.14	1.62	1.39
25.1	0.61	0.24	gravels and sand	1.03		1.00	0.58	3.14	1.82	1.82
28.3	0.62	0.25	gravels and sand	1.01		1.02	0.62	3.14	1.93	1.97
31.4	0.59	0.24	gravels and sand	0.93		0.97	0.61	3.14	1.90	1.84
34.6	0.50	0.20	gravels and sand	1.08		1.00	0.55	3.14	1.71	1.72
37.7	0.40	0.16	gravels and sand	0.94		1.01	0.45	3.14	1.41	1.43
40.8	0.24	0.10	gravels and sand	0.71		0.82	0.32	3.14	1.01	0.83
44.0	0.10	0.04	gravels and sand	0.37		0.54	0.17	3.14	0.53	0.29
48.1	0.00	0.00	river right, gravel bar	0.00		0.19	0.05	4.08	0.20	0.04

Avg. Depth: 0.33 m

Max. Depth: 0.62 m

Avg. Velocity: 0.66 m/sec

Max.Velocity: 1.08 m/sec

Total Discharge: 14.2 m^3/sec

Appendix E5.–Worksheet used to calculate river discharge at Tatlawiksuk River weir on 7 September, 2005.

Location: Tatlawiksuk River weir

Date: 9/7/2005

Description: Approx. 50 m downstream of weir

Gauge Height: 82 cm

Crew: Dan Costello, Duke Pensgard

Comments: Water level is near the historical average for this date.

Meter Type: AA

Station **Dist.** (m)	Stream **Depth** (m)	Meter **Height** (m)	Substrate Description	**Velocity** (m/sec) Point	Mean Vert.	Mean Cell	Cell Depth (m)	Width (m)	Area (m^2)	Flow (m^3/sec)
0.0	0.00	-	river left, gravel bar	0.00		-	-	-	-	-
3.0	0.35	0.14	gravels and sand	0.48		0.24	0.18	2.97	0.52	0.12
5.9	0.50	0.20	gravels and sand	0.66		0.57	0.43	2.97	1.26	0.72
8.9	0.75	0.30	gravels and sand	0.79		0.73	0.63	2.97	1.86	1.35
11.9	0.85	0.34	gravels and sand	0.84		0.82	0.80	2.97	2.38	1.94
14.8	0.90	0.36	gravels and sand	0.98		0.91	0.88	2.97	2.60	2.36
17.8	0.90	0.36	gravels and sand	0.88		0.93	0.90	2.97	2.67	2.47
20.8	1.00	0.40	gravels and sand	0.88		0.88	0.95	2.97	2.82	2.48
23.8	1.00	0.40	gravels and sand	0.93		0.91	1.00	2.97	2.97	2.69
26.7	1.05	0.42	gravels and sand	0.97		0.95	1.03	2.97	3.04	2.89
29.7	1.05	0.42	gravels and sand	1.06		1.01	1.05	2.97	3.12	3.16
32.7	1.05	0.42	gravels and sand	1.19		1.12	1.05	2.97	3.12	3.50
35.6	1.20	0.48	gravels and sand	1.17		1.18	1.13	2.97	3.34	3.94
38.6	1.05	0.42	gravels and sand	1.26		1.22	1.13	2.97	3.34	4.06
41.6	1.00	0.40	gravels and sand	1.39		1.33	1.03	2.97	3.04	4.03
44.5	0.90	0.36	gravels and sand	1.08		1.24	0.95	2.97	2.82	3.48
47.5	0.75	0.30	gravels and sand	0.87		0.97	0.83	2.97	2.45	2.39
50.5	0.65	0.26	gravels and sand	0.94		0.90	0.70	2.97	2.08	1.87
53.4	0.60	0.24	gravels and sand	0.85		0.89	0.63	2.97	1.86	1.66
56.4	0.40	0.16	gravels and sand	0.67		0.76	0.50	2.97	1.48	1.13
59.4	0.30	0.12	gravels and sand	0.24		0.46	0.35	2.97	1.04	0.47
60.9	0.00	0.00	river right, gravel bar	0.00		0.12	0.15	1.48	0.22	0.03

Avg. Depth: 0.74 m Avg. Velocity: 0.82 m/sec

Max. Depth: 1.20 m Max.Velocity: 1.39 m/sec

Total Discharge: 46.8 m^3/sec

Appendix E6.–Worksheet used to calculate river discharge at Tatlawiksuk River weir on 18 September, 2005.

Location: Tatlawiksuk River weir **Date:** 9/18/2005

Description: Approx. 50 m downstream of weir **Gauge Height:** 100 cm

Crew: Rob Stewart, Caroline Kvamme

Comments: Water level is near the upper limits of weir operation **Meter Type:** AA

Station **Dist.** (m)	Stream **Depth** (m)	Meter **Height** (m)	Substrate Description	**Velocity** (m/sec) Point	Mean Vert.	Mean Cell	Cell Depth (m)	Width (m)	Area (m^2)	Flow (m^3/sec)
0	0.00	-	river left, gravel bar	0.00		-	-	-	-	-
4	0.60	0.24	gravels and sand	0.58		0.29	0.30	4.43	1.33	0.39
7	0.85	0.34	gravels and sand	1.04		0.81	0.73	2.96	2.14	1.74
10	0.98	0.39	gravels and sand	1.20		1.12	0.92	2.96	2.71	3.03
13	1.04	0.42	gravels and sand	1.25		1.23	1.01	2.96	2.99	3.66
16	1.08	0.43	gravels and sand	1.20		1.23	1.06	2.96	3.13	3.84
19	1.15	0.46	gravels and sand	1.09		1.15	1.12	2.96	3.30	3.77
22	1.25	0.50	gravels and sand	1.15		1.12	1.20	2.96	3.55	3.97
25	1.25	0.50	gravels and sand	1.09		1.12	1.25	2.96	3.70	4.14
28	1.35	0.54	gravels and sand	1.36		1.23	1.30	2.96	3.84	4.71
31	1.40	0.56	gravels and sand	1.32		1.33	1.38	2.96	4.07	5.42
34	1.45	0.58	gravels and sand	1.32		1.36	1.43	2.96	4.21	5.71
37	1.40	0.56	gravels and sand	1.39		1.40	1.43	2.96	4.21	5.90
40	1.31	0.52	gravels and sand	1.41		1.31	1.36	2.96	4.01	5.23
43	1.22	0.49	gravels and sand	1.20		1.16	1.27	2.96	3.74	4.34
46	1.10	0.44	gravels and sand	1.12		1.13	1.16	2.96	3.43	3.86
49	0.95	0.38	gravels and sand	1.13		1.04	1.03	2.96	3.03	3.15
52	0.83	0.33	gravels and sand	0.95		0.98	0.89	2.96	2.63	2.59
55	0.75	0.30	gravels and sand	1.02		1.01	0.79	2.96	2.34	2.36
58	0.66	0.26	gravels and sand	1.00		0.71	0.71	2.96	2.08	1.48
61	0.59	0.24	gravels and sand	0.42		0.21	0.63	2.96	1.85	0.39
63	0.30	0.12	river right, gravel bar	0.00		0.00	0.45	2.66	1.18	0.00

Avg. Depth: 0.98 m Avg. Velocity: 1.01 m/sec

Max. Depth: 1.45 m Max.Velocity: 1.41 m/sec

Total Discharge: 69.7 m^3/sec

APPENDIX F. HISTORICAL CUMULATIVE PERCENT SALMON PASSAGE

Appendix F1.–Historical daily cumulative percent passage of Chinook and chum salmon at the Tatlawiksuk River weir.

	Chinook								Chum							
Date	**1998**	**1999**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**1998**	**1999**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**
6/15		0	0	0	0	0	0	0		0	0	0	0		0	0
6/16		0	0	0	0	0	0	0		0	0	0	0		0	0
6/17		0	0	0	0	0	0	0		0	0	0	0		0	0
6/18		0	0	0	0	0	0	0		0	0	0	0		0	0
6/19		0	0	0	0	0	1	0		0	0	0	0		1	0
6/20		0	0	0	0	0	1	0		0	0	0	0		1	0
6/21		0	0	0	0	0	1	0		0	0	0	0		1	0
6/22		0	1	0	1	0	1	1		0	0	0	1		2	0
6/23		0	1	0	4	0	1	1		0	0	0	2		2	0
6/24		0	2	0	4	1	1	1		0	0	0	2		3	0
6/25		1	2	1	4	1	4	1		0	1	1	3		6	0
6/26		1	4	4	4	3	12	2		0	2	1	4		8	0
6/27		1	5	5	28	3	13	2		1	2	1	6		9	0
6/28		2	5	7	29	12	16	2		1	2	2	8		9	0
6/29		2	5	8	37	29	19	3		2	3	3	12		11	1
6/30		3	8	13	38	33	20	9		3	4	4	14		12	1
7/01		4	11	31	39	35	31	10		4	6	6	16		15	2
7/02		4	29	32	43	36	36	13		5	13	7	20		18	5
7/03		5	35	34	48	41	39	29		6	17	7	22		21	9
7/04		7	39	34	54	43	45	38		7	19	8	26		23	11
7/05		8	44	40	69	47	53	46		8	24	10	31		26	13
7/06		9	46	61	72	49	54	49		9	26	13	38		27	15
7/07		10	48	69	78	50	57	54		11	29	16	41		30	17
7/08		10	50	70	79	52	60	57		13	30	20	44		34	20
7/09		12	59	72	80	59	68	61		16	37	24	47		38	23
7/10		14	65	73	81	61	74	64		20	40	30	51		41	26
7/11		20	71	74	83	63	76	69		24	46	33	56		43	30
7/12		28	77	76	84	65	76	72		29	54	38	59		45	35
7/13		31	78	84	85	71	80	75		32	57	43	62		49	40
7/14		36	78	86	86	75	81	80		35	57	48	65		53	46
7/15		37	79	89	90	77	82	81		38	61	54	70		56	51
7/16		42	81	89	91	78	84	84		42	66	58	72		60	57
7/17		42	87	90	91	80	89	86		46	70	63	76		64	61
7/18		52	88	92	92	81	91	89		50	73	70	80		68	65
7/19		53	89	94	92	83	92	91		51	75	74	83		71	69

-continued-

Appendix F1.–Page 2 of 3.

	Chinook								Chum							
Date	**1998**	**1999**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**1998**	**1999**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**
7/20		79	90	94	93	87	92	93		58	76	77	85		74	72
7/21		80	90	95	93	87	93	94		62	78	80	87		76	76
7/22		81	92	96	94	88	94	95		64	82	83	89		79	79
7/23		86	93	96	95	89	95	96		71	84	85	90		81	82
7/24		89	93	97	95	91	95	96		74	86	87	91		83	84
7/25		92	94	97	96	92	96	96		78	88	89	92		85	86
7/26		93	95	98	96	93	96	97		80	89	90	93		87	88
7/27		94	95	98	97	93	97	97		82	91	91	94		89	89
7/28		94	95	98	98	94	98	97		84	92	92	95		91	91
7/29		96	95	99	99	95	98	98		86	93	92	96		92	92
7/30		97	96	99	99	96	98	98		89	95	93	96		93	93
7/31		97	96	99	99	97	99	99		90	96	94	97		94	94
8/01		98	96	99	99	97	99	99		92	97	95	97		95	95
8/02		98	97	99	100	97	99	99		93	97	96	98		95	96
8/03		98	98	99	100	98	99	99		95	98	96	98		96	97
8/04		98	98	99	100	98	99	99		95	98	97	98		96	97
8/05		99	98	100	100	98	99	99		96	98	97	98		97	98
8/06		99	98	100	100	98	99	99		96	98	98	99		97	98
8/07		99	98	100	100	98	99	99		97	98	98	99		98	98
8/08		99	99	100	100	99	100	100		97	98	99	99		98	98
8/09		99	99	100	100	99	100	100		98	98	99	99		99	99
8/10		99	99	100	100	99	100	100		98	99	99	99		99	99
8/11		99	99	100	100	99	100	100		98	99	99	100		99	99
8/12		99	99	100	100	99	100	100		98	99	99	100		99	99
8/13		99	99	100	100	99	100	100		99	99	99	100		99	99
8/14		100	99	100	100	99	100	100		99	99	99	100		99	99
8/15		100	100	100	100	99	100	100		99	99	100	100		99	100
8/16		100	100	100	100	99	100	100		99	99	100	100		99	100
8/17		100	100	100	100	99	100	100		99	99	100	100		99	100
8/18		100	100	100	100	100	100	100		100	99	100	100		99	100
8/19		100	100	100	100	100	100	100		100	99	100	100		100	100
8/20		100	100	100	100	100	100	100		100	100	100	100		100	100
8/21		100	100	100	100	100	100	100		100	100	100	100		100	100
8/22		100	100	100	100	100	100	100		100	100	100	100		100	100
8/23		100	100	100	100	100	100	100		100	100	100	100		100	100

-continued-

Appendix F1.–Page 3 of 3.

	Chinook								Chum							
Date	**1998**	**1999**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**1998**	**1999**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**
8/24		100	100	100	100	100	100	100		100	100	100	100		100	100
8/25		100	100	100	100	100	100	100		100	100	100	100		100	100
8/26		100	100	100	100	100	100	100		100	100	100	100		100	100
8/27		100	100	100	100	100	100	100		100	100	100	100		100	100
8/28		100	100	100	100	100	100	100		100	100	100	100		100	100
8/29		100	100	100	100	100	100	100		100	100	100	100		100	100
8/30		100	100	100	100	100	100	100		100	100	100	100		100	100
8/31		100	100	100	100	100	100	100		100	100	100	100		100	100
9/01		100	100	100	100	100	100	100		100	100	100	100		100	100
9/02		100	100	100	100	100	100	100		100	100	100	100		100	100
9/03		100	100	100	100	100	100	100		100	100	100	100		100	100
9/04		100	100	100	100	100	100	100		100	100	100	100		100	100
9/05		100	100	100	100	100	100	100		100	100	100	100		100	100
9/06		100	100	100	100	100	100	100		100	100	100	100		100	100
9/07		100	100	100	100	100	100	100		100	100	100	100		100	100
9/08		100	100	100	100	100	100	100		100	100	100	100		100	100
9/09		100	100	100	100	100	100	100		100	100	100	100		100	100
9/10		100	100	100	100	100	100	100		100	100	100	100		100	100
9/11		100	100	100	100	100	100	100		100	100	100	100		100	100
9/12		100	100	100	100	100	100	100		100	100	100	100		100	100
9/13		100	100	100	100	100	100	100		100	100	100	100		100	100
9/14		100	100	100	100	100	100	100		100	100	100	100		100	100
9/15		100	100	100	100	100	100	100		100	100	100	100		100	100
9/16		100	100	100	100	100	100	100		100	100	100	100		100	100
9/17		100	100	100	100	100	100	100		100	100	100	100		100	100
9/18		100	100	100	100	100	100	100		100	100	100	100		100	100
9/19		100	100	100	100	100	100	100		100	100	100	100			100
9/20		100	100	100	100	100	100	100		100	100	100	100			100

Note: The boxes represent the median passage date and central 50% of the run. Days with no data are days when the project was not operational.

Appendix F2.–Historical daily cumulative percent passage of sockeye and coho salmon at the Tatlawiksuk River weir.

	Sockeye								Coho						
Date	1998	1999	2000	2001	2002	2003	2004	2005	1999	2000	2001	2002	2003	2004	2005
6/15					0		0	0	0		0	0		0	0
6/16					0		0	0	0		0	0		0	0
6/17					0		0	0	0		0	0		0	0
6/18					0		0	0	0		0	0		0	0
6/19					0		0	0	0		0	0		0	0
6/20					0		0	0	0		0	0		0	0
6/21					0		0	0	0		0	0		0	0
6/22					0		0	0	0		0	0		0	0
6/23					0		0	0	0		0	0		0	0
6/24					0		0	0	0		0	0		0	0
6/25					0		0	0	0		0	0		0	0
6/26					0		0	0	0		0	0		0	0
6/27					0		0	0	0		0	0		0	0
6/28					0		0	0	0		0	0		0	0
6/29					0		0	0	0		0	0		0	0
6/30					0		0	0	0		0	0		0	0
7/01					0		0	0	0		0	0		0	0
7/02					0		0	0	0		0	0		0	0
7/03					0		0	0	0		0	0		0	0
7/04					0		0	0	0		0	0		0	0
7/05					0		0	0	0		0	0		0	0
7/06					0		0	0	0		0	0		0	0
7/07					0		0	0	0		0	0		0	0
7/08					0		0	0	0		0	0		0	0
7/09					0		0	0	0		0	0		0	0
7/10					0		0	0	0		0	0		0	0
7/11					0		0	0	0		0	0		0	0
7/12					0		0	0	0		0	0		0	0
7/13					0		0	1	0		0	0		0	0
7/14					0		0	3	0		0	0		0	0
7/15					0		0	3	0		0	0		0	0
7/16					0		0	7	0		0	0		0	0
7/17					0		0	9	0		0	0		0	0
7/18					0		0	10	0		0	0		0	0
7/19					0		10	13	0		0	0		0	0

-continued-

Date	Sockeye								Coho						
	1998	1999	2000	2001	2002	2003	2004	2005	1999	2000	2001	2002	2003	2004	2005
7/20					0		10	18	0		0	0		0	0
7/21					0		10	20	0		0	0		0	0
7/22					0		10	22	0		0	0		0	0
7/23					0		10	25	0		0	0		0	0
7/24					0		10	29	0		0	0		0	0
7/25					0		10	31	0		0	0		0	0
7/26					0		10	36	0		0	0		0	0
7/27					0		10	39	0		0	0		0	1
7/28					0		10	43	0		0	0		1	1
7/29					0		10	44	0		0	0		1	1
7/30					0		10	50	0		0	0		1	2
7/31					0		20	50	0		0	0		1	2
8/01					0		20	52	0		1	0		2	2
8/02					0		20	55	0		1	0		2	3
8/03					0		20	57	0		1	0		3	4
8/04					0		20	60	0		2	0		4	4
8/05					0		30	60	0		3	1		5	5
8/06					0		30	70	0		3	1		8	5
8/07					0		30	75	1		4	1		11	6
8/08					0		30	78	1		5	2		13	7
8/09					0		30	84	1		6	2		16	10
8/10					0		40	90	1		9	3		20	11
8/11					0		60	92	1		11	4		22	13
8/12					0		60	92	1		14	8		27	14
8/13					0		60	92	1		17	14		30	15
8/14					0		60	92	2		25	17		34	17
8/15					0		60	93	2		30	19		38	18
8/16					0		60	93	3		38	22		41	19
8/17					0		60	95	4		44	22		44	23
8/18					0		60	95	5		50	25		48	25
8/19					0		60	95	6		56	25		52	26
8/20					0		60	95	8		60	26		55	28
8/21					0		60	95	10		65	36		59	30
8/22					0		60	95	11		69	40		64	31
8/23					0		60	95	13		73	52		68	41

-continued-

Appendix F2.–Page 3 of 3.

	Sockeye								Coho						
Date	**1998**	**1999**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**1999**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**
8/24					0		60	95	16		76	61		71	52
8/25					0		70	95	18		79	66		75	56
8/26					0		70	95	21		82	72		77	59
8/27					0		70	96	24		84	75		78	61
8/28					0		70	97	29		86	78		80	64
8/29					100		70	97	34		87	79		82	67
8/30					100		70	99	37		89	80		83	69
8/31					100		70	99	42		91	83		85	72
9/01					100		70	100	49		92	87		88	73
9/02					100		70	100	54		93	89		89	74
9/03					100		70	100	58		94	89		91	75
9/04					100		70	100	64		94	91		92	79
9/05					100		80	100	69		95	93		93	82
9/06					100		80	100	72		95	93		94	85
9/07					100		80	100	73		96	96		94	86
9/08					100		80	100	74		96	96		95	88
9/09					100		80	100	76		97	97		96	89
9/10					100		90	100	84		97	97		97	91
9/11					100		90	100	87		97	98		97	92
9/12					100		90	100	89		98	98		98	94
9/13					100		90	100	92		98	98		99	95
9/14					100		90	100	94		98	99		99	96
9/15					100		90	100	96		99	99		100	97
9/16					100		90	100	96		99	99		100	98
9/17					100		90	100	97		100	100		100	99
9/18					100		100	100	98		100	100		100	99
9/19					100			100	100		100	100		100	100
9/20					100			100	100		100	100		100	100

Note: The boxes represent the median passage date and central 50% of the run. Days with no data are days when the project was not operational.